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Entrepreneurship and Culture in the Age of Nomadic Intelligence

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29th International Conference on IT Applications and Management

THEME: ENTREPRENEURSHIP AND CULTURE IN THE AGE OF NOMADIC INTELLIGENCE

Hosted and Supported by Korea Data Strategy Society, University of Cagliari, Italy

July 4 ~ 9, 2024

Venue: Regina Margherita Hotel, Cagliari

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Letter from the Chairman of IITAMS On ITAM-29, Italy

As we gather here today to mark the commencement of the IT Applications and Management Society's annual conference, it fills me with great pride and humility to stand before you as the chairman of this esteemed gathering. With unwavering dedication and a shared vision for innovation, we embark on a journey that transcends borders and cultural limitations.

The theme of this year's conference, "Entrepreneurship and Culture in the Age of Nomadic Intelligence," encapsulates the essence of our rapidly evolving digital landscape. In an era where geographical boundaries blur and information flows seamlessly across continents, the concept of nomadic intelligence resonates deeply. It reflects our ability to adapt, collaborate, and thrive in a world characterized by constant flux and perpetual connectivity.

Entrepreneurship, the driving force behind countless technological breakthroughs, lies at the heart of our endeavors. It embodies the spirit of innovation, risk-taking, and resilience that fuels progress and transforms ideas into reality. As advocates of entrepreneurship, we embrace diversity, harnessing the collective wisdom of individuals from diverse backgrounds, cultures, and perspectives to fuel creativity and drive meaningful change.

Yet, entrepreneurship alone cannot flourish without a fertile cultural ecosystem to nurture and sustain it. Culture shapes our values, beliefs, and behaviors, serving as the cornerstone upon which innovation thrives. Whether it's fostering a culture of collaboration, celebrating diversity, or cultivating a spirit of experimentation, our collective efforts to nurture an inclusive and empowering cultural milieu are essential to unlocking the full potential of entrepreneurship in the digital age.

In this context, the notion of nomadic intelligence assumes profound significance. It embodies the fluidity, adaptability, and boundary-less nature of our interconnected world. As nomads of the digital realm, we traverse virtual landscapes, forging connections, exchanging ideas, and co-creating solutions to complex challenges. Our nomadic intelligence enables us to navigate uncertainty with agility, leveraging emerging technologies and harnessing the power of collective intelligence to shape the future of IT applications and management.

As we embark on this transformative journey together, let us embrace the diversity of thought and perspective that defines our global community, recognizing that our differences are a source of strength and innovation. Let us harness the boundless potential of nomadic intelligence to drive positive change and create a more inclusive, sustainable, and prosperous future for all.

In conclusion, I extend my heartfelt gratitude to each and every one of you for your unwavering support, dedication, and contributions to the ITAM congress. Hope each and every one enjoy every bit of this event hosted by Professor CinziaDessi and the historic University of Cagliari.

Thank you,

Namjae Cho

Namjae Cho

Chairman, International ITAM Society
Professor of Hanyang University, Seoul, Korea

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Pre-Conference Symposium: Future of Asia (July 4, 2024, THURSDAY)

Venue: Regina Margherita Hotel, Cagliari

Time	Future of Asia Symposium
15:00~18:00	**15:00** Assemble at the "Villanova" meeting room of Regina Margherita Hotel, Cagliari **15:30~16:30 Speaker: Mr. Alex Queen (CEO, Queen and Co.)** **Theme: Empowering Innovation in Asia, the Next Story** **16:30~18:00** Freestyle Discussion with Panel and Participants
18:00~20:00	**Buffet Dinner and Interaction** Function Hall of Regina Margherita Hotel

Conference Inauguration Plenary Session (July 5, 2024, FRIDAY)

Venue: Faculty of Business and Economics, University of Cagliari

Time	ITAM-29 ITAM Conference
08:30~09:00	**Registration**
	Plenary Inauguration Session Room: Aula Magna di Scienze Politiche
09:00~10:40	**Session Chair:** Nok Sakuna (KMIT, Thailand) **Opening Announcement** **-** Cinzia Dessi (Chair of Org. Committee, U. of Cagliari, Italy) **Welcoming Remark** - Patrizio Monfardini (Director of the Department of Economics and Business Sciences, Faculty of Business and Economics, U. of Cagliari, Italy) **Greeting** - Jeong Hoon Lee (President of KDSS, Hansung U., Korea) - Sateesh Kumar Ojha (Publication Chair of ITAM, Lincoln U. College, Nepal) - Namjae Cho (Chairman, International ITAM Society, Hanyang U. Korea) **Conference of Appreciation Plaque:** to Previous Chair of Organizing Committee, Prof. Yi-Fen Huang, (NTUST, Taiwan) **Keynote Speech** Introducing Speaker 1: Cinzia Dessi (U. of Cagliari, Italy) **Speaker 1: Giuseppe Melis** (Marketing and Tourism Marketing, U. of Cagliari) **Theme: Culture-driven Local Development in Sardinia: the Role of History** Introducing Speaker 2: Santosh Rangnekar (IIT, Roorkee, India) **Speaker 2: Upinder Dhar** (Vice-Chancellor, Shri Vaishnav Vidyapeeth Vishwavidyalaya, India) **Theme: Constituents of Design Thinking Mindset**
10:40~11:00	**Coffee Break**

Parallel Technical Sessions (July 5, 2024, FRIDAY)

Venue: Faculty of Business and Economics, University of Cagliari

Time	Track A Room: 11	Track B Room: 11bis	Track C Room: 13
Session 1 11:00~12:30	**Session A1** **Sustainability Considerations** Chair: Kanes Rajah (CEPD London, UK)	**Session B1** **Intelligent Technology and Market Interaction** Chair: Kyungjin Cha (Hanyang U., Korea)	**Session C1** **Designing Interaction with Intelligence Technology** Chair: Thanachart Ritbumroong (NIDA, Thailand)
	A1.1 Historical Evolution of the South Korea's Sustainability Intentions and the Shift from Power to Responsibility in Chaebols Cincia Dessi, Andrea Vincis (U. of Cagliari, Italy)	**B1.1 A Comparative Study on Influencing Factors of Repurchase Intention in Internet Shopping Platforms in South Korea, China, and India: A Two-Stage SEM-Artificial Neural Network Analysis** Sundong Kwon, Paul Aniruddha (Chungbuk National U., Korea)	**C1.1 Emotional Bonds and Rational Minds: How Anthropomorphism and Intelligence Shape Trust in AI Adoption** Thanachart Ritbumroong, Songwut Ahmornahnukulb, Phaninthorn Swanyawatthagac (Nat'l Inst. of Development Administration, Thailand)
	A1.2 Sustainable Anti-Consumption of Household Products: A Systematic Literature Review Ava Shrestha Hyoju (Lincoln U. College, Malaysia)	**B1.2 Relation Between Increasing Digital Technology and Customer Banking Services** Rajan Singh Bhandari, Sateesh Kumar Ojha (Lincoln U. College, Malaysia)	**C1.2 Assessing the AI adoption readiness in Humanitarian supply chain management (Relief supply chain): An Indian perspective** Siddharth Prajapati Ramesh Anbanandam (IIT Roorkee, India)
	A1.3 Role of Digital Transformation in Mountain Tourism for Future Sustainability: A Case Study of Nepal Dinesh Basnet, Jagdish Chandra Wagle (Lincoln U. College, Malaysia)	**B1.3 The Impact of Cross-platform Diversification: A Case Study on Food Delivery Sector in South Korea** Changhyun Lee, Kyungjin Cha (Hanyang U., Korea)	**C1.3 Application of Artificial Intelligence (AI) in HR** Sarala Karki (Lincoln U. College, Malaysia)
	A1.4 Bibliometric Analysis on Green Cosmetic: A Systematic Literature Review and Future Scope Shatabdi Sonkar, Pragya Singh, Rachit Dwivedi (IIIT Allahabad, India)	**B1.4 Frugal Innovation in Resource-Limited Settings: Leveraging Technology for Healthcare Advancements in Nepal** Amar Bahadur Lama (Waiba Infratech, Nepal) Adip Tamang (Longtang Khola, Nepal)	**C1.4 The Impact of AI Utilization on the Effectiveness of Piano Pedagogy Method Components for Advanced Learners** Mijung Cho (Chung-Ang U., Korea)

12:30~14:00	**Lunch Break**		
Session 2 14:00~15:30	**Session A2**: **Design Thinking and HR Development** Chair: Pragya Singh (IIIT Allahabad, India)	**Session B2** **SME, Technology and Entrepreneurship** Chair*:* Giuseppe Melis (U. of Cagliari, Italy)	**Session C2**: **Methods of Intelligent Technology Application** Chair: Om Prakash Giri (Pokhara U., Nepal)
	A2.1 Transforming HR through Design Thinking Santosh Dhar, Upinder Dhar (SVVV, India) **A2.2 Project-Based Learning through Design Thinking in Statistics Education: An Empirical Study of Thai Undergraduate Students** Sakuna Srianomai (King Mongkut's Institute of Tech., Thailand), Pitchayaporn Pongsakornrungsilp (Kasetsart U., Thailand) **A2.3 Uncovering Social Intelligence: A Review** Prashant Mishra, Santosh Rangnekar (IIT Roorkee, India) **A2.4 Conflict Management in Team: A Systematic Review** Malati Basnet (Lincoln U. College, Malaysia)	**B2.1 Digital transformation, entrepreneurship and culture in Sardinia's traditional sector of sheep and goat farming** Clementina Casula, Giuseppe Melis (U. of Cagliari, Italy) **B2.2 Measuring Entrepreneurial Legacy and Succession Strategy: Scale Development and Validation** Yi-Fen Huang (National Taichung U. of Science and Technology, Taiwan) **B2.3 Impact of corporate environment and technological characteristics on the adoption and use of smart factories by SMEs** Namjae Cho, Soo Mi Moon (Hanyang U., Korea) **B2.4 Enhancing SME Performance through Intellectual Capital: A Systematic Review and Research Roadmap** Nimesh Prasad Adhikary (Lincoln U. College, Malaysia)	**C2.1 Application of Decision Trees and Random Forest Algorithm in Predicting Business Problems** Sateesh Kumar Ojha, Arjun Kumar Niroula (Lincoln U. College, Malaysia) **C2.2 Application of divide-and-conquer algorithm for business and non-business problems** Sateesh Kumar Ojha (Lincoln U. College, Malaysia) **C2.3 Teaching and Learning with Technology: Effectiveness of ICT Integration in Institutional Schools of Nepal** Yashodham Tripathi (City Education Foundation, Kathmandu Nepal) Sateesh Kumar Ojha, (Lincoln U. College, Malaysia) **C2.4 Uses of Education Management Information System (EMIS) in Universities of Nepal** Rabin Panthi (Lumbini Buddhist U. Nepal)
15:30~16:00	**Coffee Break**		

	Session A3: **Cultural Issues In Tourism** Chair: Yanki Hartijasti (U. of Indonesia)	**Session B3** **Financial Issues in Practice** **Chair: Vikas Thakur (IIT Kharagpur, India)**	**Session C3:** **Issues in Public and Social Services** **Chair: Jaehoon Whang (Yonsei U., Korea)**
Session 3 16:00~17:30	**A3.1 Sustainable Tourism and Sustainable Development: A Thematic Analysis** Harshita Tiwari, Pragya Singh, Tuba Mahfooz, Supriya Kumari (IIIT Allahabad, India) **A3.2 Analysis of Muslim Tourist's Intension to Travel to Non-Muslim Countries: A Comparative Study between the Philippines and South Korea** Yanki Hartijasti (U. of Indonesia, Indonesia) Namjae Cho(Hanyang U., Korea) **A3.3 The Evaluation of Satisfaction of Businesses with the Party Logistics Service Quality in the context of Nepal** Suman Bhattarai (Lincoln U. College Malaysia) **A3.4 Regular Application of Waste Water for Reclamation of Desert** Rajan Raj Pandey (Lincoln U. College, Malaysia)	**B3.1 Financial Challenges posed to MSMEs due to recent development in the Indian Economy: A Case Study of Odisha, India** Vikas Thakur (IIT Kharagpur, India) **B3.2 Analysis of the Volatility Effect of Stock Market Caused by Policy Events** Jiayu Yang, Lu Zhao, Zhijing Wu (Fudan U., China), Yanqiang Xie((Hunan Chemical Vocational Technology, China), Weihui Dai ((Fudan U., China) **B3.3 Factors Affecting Borrower's Over-indebtedness in Microfinance** Sunil Parajuli (Singhania U., India) **B3.4 Speech Analysis of Defense Attorney Based on Neural Responses** Xuan Zhou (Zhejiang U., China), Wenqing Qian (U. of Michigan, USA), Jiayu Yang, Weihui Dai (Fudan U. China)	**C3.1 Enhancing Digital Competence for Public Servants: A Framework for the Digital Platform Government** Myeonggil Choi (Chung-Ang U. Korea) **C3.2 Assessment of Factors Affecting Labor Productivity in Road Construction Projects** Om Prakash Giri, Indira Giri (Pokhara U., Nepal) **C3.3 Empirical analysis of the relationship between participation motivation, service attributes and satisfaction of a blockchain-based Universal Loyalty platform** Kihyun Kim, Jeonghoon Lee (Hansung U., Korea) Jaehoon Whang (Yonsei U., Korea) **C3.4 A study of the schools in Rupandehi Districts from the Perspectives of their Learning Delivery to Response Society, Nations, and Individual Learners** Shree Prasad Bhattarai (Lumbini Buddhist U. Nepal)
17:30~18:00	**Valedictory Session** - Namjae Cho (Chairman, International ITAM Society, Hanyang U. Korea) - Jong Ho Kim (President of Korea Internet eCommerce Society, Kyung Sung U., Korea)		
18:30~	**Conference Banquet** Gala dinner at "Villa Fanny" "Giardino d'inverno" dinner room		

Industrial Visit and Culture Activities (July 6-8, 2024, FRIDAY) (registered delegates only)

Time	Events
July 6 SATURDAY **10:00~18:00**	**Cagliari Citi Visit and Interaction** Four Historical Districts (Castello + Underground Cagliari) Churches, Museums and Monuments (Meals not included)
July 7 SUNDAY **10:00~18:00**	**Roman Archeological Sites and Interaction** **Inland of Sardinia Island,** Morning: Casa Zapata, Su Nuraxi Lunch at Nuraghe Afternoon: Centro Culturale Giovanni Lilliu Back to Cagliari Hotels by 5PM
July 8 MONDAY **10:00~18:00**	**Company visits** Morning: Cheese factory - Argiolas Formaggi Lunch at a farmhouse in Serdinia Afternoon: Wine factory - Cantine Argiolas

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Historical Evolution of the South Korea's Sustainability Intentions and the shift from Power to Responsibility in Chaebols

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Abstract
This study examines the historical evolution of South Korea's sustainability intentions through the influence of its Chaebols—large, family-owned conglomerates. Since the 1960s, Chaebols such as Samsung, Hyundai, LG, and SK Group have been instrumental in transforming South Korea from an agrarian society into an industrial powerhouse. Initially focused on rapid industrialization and economic growth, these conglomerates have faced significant public and academic scrutiny. Over time, there has been a marked shift towards integrating Corporate Social Responsibility (CSR) within Chaebol corporate governance (CG), driven by domestic pressures and global sustainability trends. Based on a comprehensive review of current literature, this analysis seeks to uncover how CSR has been strategically incorporated into Chaebol's governance structures and the Korean government's role in promoting socially responsible business practices to enhance sustainability policies. Understanding this historical progression is essential to appreciating how Chaebols navigate the balance between profitability and their commitment to ethical, sustainable practices, thereby shaping the socio-economic landscape of South Korea.

Keywords*: Chaebols, Corporate Governance (CG), Corporate Social Responsibility (CSR), South Korea, Government.*

Introduction

This research framework aims to analyze the historical evolution of South Korea's intentions towards sustainability through the lens of its large family-owned conglomerates, known as Chaebols, and their Corporate Social Responsibility (CSR) practices. Since the mid-1960s, Chaebols such as Samsung, Hyundai, LG, and SK Group have been pivotal in transforming South Korea from an agrarian society into an industrial economy, gaining significant economic and political influence. While these conglomerates have contributed significantly to the nation's GDP, they employ a relatively small portion of the workforce. The concentrated control by founding families and preferential government policies have made Chaebols globally competitive, yet they have also faced criticism for fostering economic disparities and engaging in corrupt practices. This dual perception provides a rich context for examining how Chaebols utilize CSR to enhance or protect their reputations amid credibility challenges.

In this framework, CSR is defined as corporate actions that exceed legal or regulatory requirements, focusing on activities that promote sustainable societal growth across environmental, social, economic, stakeholder, and voluntary dimensions. This comprehensive view allows for assessing Chaebol's CSR initiatives as voluntary contributions to societal well-being rather than mere legal obligations. The research aims to create a dual-purpose framework: first, to elucidate how Chaebols have integrated CSR into their strategic and operational practices from the 1960s to the present, and second, to explore the role of the Korean government in promoting CSR among Chaebols, including the incentives and support mechanisms that encourage socially responsible practices. By tracing the historical progression of these initiatives, this study seeks to understand the complex relationship between Chaebols, CSR, and the broader socio-economic landscape of South Korea.

Review of the Literature

This study aims to provide a theoretical analysis of South Korean literature and context, focusing on the historical evolution of Chaebols and the South Korean

government's approaches to Corporate Governance (CG) and CSR from the 1960s to the present. By exploring these developments, the paper seeks to elucidate the historical trajectory leading to the current state of affairs. Through a review of current literature, this research aims to offer a nuanced understanding of CSR within the unique context of South Korean Chaebols, shedding light on how these powerful entities balance economic goals with social and environmental responsibilities and the role of government support in this process. In the early 1960s, South Korea was one of the poorest nations globally, struggling to rebuild after the Korean War (Kim, 2013). The country's transformation into an economic powerhouse is a testament to strategic policy implementation and industrial resilience. This shift began with comprehensive economic reforms that promoted rapid industrial growth by encouraging private ownership and offering financial and non-financial incentives to businesses aligned with national development goals. Regulatory limitations on commercial bank ownership in South Korea led Chaebols to adopt unique financial strategies, relying heavily on internal funding and investments in non-bank financial institutions (Almeida et al., 2015). During the 1970s, the Korean government supported the largest Chaebols through state-owned banks, often at the expense of smaller enterprises (Haggard and Moon, 1990). This support helped Chaebols like Samsung and Hyundai become multinational corporations with significant global influence. Chaebols are large, family-owned conglomerates operating across various industries with strong government ties (Kim, 2013). They include prominent groups such as Samsung, Hyundai, SK, LG, and others. These conglomerates represent the backbone of South Korea's economic rise, characterized by their diverse business ventures and deep governmental connections. The founding families maintain control through complex cross-shareholdings, guiding strategic directions, and sustaining dominance across sectors. The symbiotic relationship between Chaebols and the government has fostered rapid industrial growth while shielding them from foreign competition. However, this relationship has sparked controversy and calls for regulatory reforms to ensure a fairer business landscape. Despite criticisms, Chaebol's impact on South Korea's transformation into a high-tech economy is undeniable. As the country evolves, so does the discourse on Chaebol's future, particularly regarding governance and government relations. Efforts are being made to align their operations more closely with CSR principles, addressing market competition, economic disparity, and CG. These reforms aim to enhance transparency, reduce family control, and cultivate a competitive economy, ensuring Chaebols continue to drive South Korea's economic narrative forward ambitiously and equitably.

Methodology

This study adopts a theoretical approach, investigating into existing literature and conceptual frameworks to develop new insights on Chaebols, CG, and CSR. By critically analyzing and synthesizing established knowledge, we aim to pinpoint and address current gaps in understanding. This method is crucial, as it grounds our investigation in extensive academic discourse while highlighting areas for further exploration and growth. Our approach fosters a dynamic interaction between theory and context to enrich the academic discussion on the historical evolution of South Korean intentions toward sustainability practices.

Results and main conclusions

The historical evolution of South Korea's intentions toward sustainability through chaebol's corporate governance practices has significantly transformed. Initially, chaebols were narrowly focused on maximizing shareholder value, reflecting the principles of agency theory which emphasized the need to oversee managerial decisions to mitigate the risks associated with the separation of ownership and control. However, as the country's businesses transitioned from smaller entrepreneurial ventures to larger, professionally managed entities, the corporate governance of these conglomerates began to encompass the diverse interests of various stakeholders beyond just shareholders. This shift toward a stakeholder-oriented model recognized the importance of balancing the interests of employees, customers, suppliers, and the broader community, creating a comprehensive accountability framework that included legal obligations, corporate regulations, and informal practices.

Sustainability has become central to modern CG, driven by stakeholder demands for corporations to address their social and environmental impacts. Environmental, social, and governance (ESG) standards are now critical components of CG, emphasizing sustainable practices for their intrinsic value and their role in enhancing long-term viability and firm performance. The role of the board of directors has also evolved, balancing oversight and strategic counsel, reflecting a blend of agency theory and resource-dependence theory. Key milestones shaping CG include the post-Great Depression financial regulations in the U.S., the post-World War II era in Europe, the late 20th-century financial scandals in the UK, and the early 21st-century financial misdeeds leading to the Sarbanes-Oxley Act. These milestones highlight the ongoing challenge of balancing shareholder-centric models with broader stakeholder demands, particularly environmental and social concerns.

Since Milton Friedman's 1970 assertion that CSR misallocated resources and harmed shareholder interests, the discourse on business practices and sustainability has evolved dramatically. Contrary to Friedman's view, modern companies have demonstrated that sustainable practices

can enhance economic performance, prioritizing people, planet, prosperity, and partnership. The Brundtland Report (1987) introduced sustainable development, emphasizing the interconnectedness of economic, environmental, and social well-being, which has since evolved into the broader notion of sustainability. The 2030 Agenda for Sustainable Development, adopted by the United Nations in 2015, challenges companies to align their business models with the Sustainable Development Goals (SDGs). Modern CG practices must balance economic goals with environmental stewardship and social responsibility, embodying the triple bottom-line framework. This approach requires reevaluating corporate performance metrics, including social justice, economic prosperity, and environmental quality. Implementing sustainability in CG involves managing resources to minimize environmental impact and promoting practices that enhance social well-being. Businesses are increasingly seen as leaders in the global transition toward sustainability, creating long-term value that benefits the environment, society, and future generations beyond financial gains. This comprehensive approach challenges the initial skepticism about sustainability costs, highlighting the importance of current investments in securing a sustainable and prosperous future for all.

The interplay between Chaebols and CSR offers a unique perspective on corporate governance and ethical business practices within these influential conglomerates. As key players in South Korea's economy, Chaebols extend their influence beyond economics into socio-political realms, impacting societal and environmental well-being. Examining Chaebols through the lens of CSR highlights their role in social obligations, ethical considerations, and the broader implications of corporate dominance. Emerging from government-led industrialization strategies, Chaebols have significantly transformed South Korea into a global economic powerhouse, though their expansion has been marred by controversies such as monopolistic practices, nepotism, and lack of transparency. The concentration of power within family-owned structures has fueled economic inequality and corporate ethics debates.

CSR is broadly defined as a self-regulating model that enables companies to be socially accountable, involving activities beyond legal obligations to contribute positively to society. This includes efforts in environmental sustainability, ethical labor practices, and a growing emphasis on transparency and accountability. Historically, Chaebols prioritized economic growth, often neglecting social and environmental responsibilities. However, recent shifts towards CSR reflect global trends and an effort to improve public image. Major conglomerates like Samsung, Hyundai, LG, and SK Group have launched various CSR initiatives, signaling a move towards integrating social value into their business models.

Despite these initiatives, the authenticity and effectiveness of Chaebols' CSR practices remain contentious. Critics argue that many initiatives are superficial and aimed more at image management than genuine social responsibility. The centralization of control within Chaebol families raises concerns about transparency, accountability, and potential conflicts of interest, highlighting ethical dilemmas in balancing profit-making with societal responsibilities. The evolving relationship between Chaebols and CSR in South Korea presents a complex picture of changing business ethics and governance. There has been a gradual shift towards embedding social responsibility into corporate operations, influenced by global trends and domestic pressures. However, challenges persist, especially regarding the depth and authenticity of CSR initiatives, which often appear more as public relations strategies than core corporate values. Traditionally, Chaebols' CSR efforts focused on philanthropy and community relations, involving charitable donations and volunteerism. However, the timing of these donations, often following legal issues involving Chaebol owners, has raised questions about their motivations, suggesting these actions may be attempts to divert attention from legal problems rather than genuine efforts to contribute to society. Despite these criticisms, both the government and corporations have been pushing for more integrated and strategic CSR approaches.

Post-Asian financial crisis, the Korean government has promoted CSR among major corporations through legislation, guidelines, and initiatives to foster accountability, ethical conduct, and sustainable development. This includes creating committees and institutions dedicated to sustainability management, such as the Business Institute for Sustainable Development, and initiatives to bridge gaps between large corporations and small to medium-sized enterprises (SMEs). Establishing the Korea Institute of Corporate Governance and Sustainability (KCGS) signifies a deepened commitment to integrating sustainability into CG. KCGS guides companies toward sustainable growth by evaluating their governance, environmental, and social practices. Despite these advancements, Chaebols continue to face scrutiny over their CSR practices. The central critique is that CSR remains peripheral to its core operations, needing more integration into its strategic planning. This highlights a broader issue within the Korean corporate sector, where economic and social disparities persist, and stakeholder concerns are often sidelined in favor of economic growth.

The trajectory of CSR in South Korea, particularly among Chaebols, reflects a complex blend of progress and ongoing challenges. While the increase in diversity and number of CSR initiatives is commendable, questions about their sincerity and impact persist. The development of entities like the Korea Institute of Corporate Governance and Sustainability underscores a growing recognition

of sustainable and ethical business practices. However, fully integrating CSR into Chaebols' core corporate identity and operations remains a work in progress. For managers, recognizing CSR as a strategic asset rather than a mere public relations tool is crucial, as well as aligning initiatives with the company's mission to address societal and environmental challenges. Transparency and accountability in CSR reporting are essential to mitigate cynicism and foster public trust. Proactive engagement with regulatory frameworks and institutions like KCGS is vital to align business practices with national sustainability goals, adopting and reporting on ESG standards to meet corporate success criteria. Integrating CSR into strategic planning addresses socioeconomic disparities and aligns economic growth with societal well-being. This study explores the dynamic interplay between South Korea's Chaebols and their CSR engagements, focusing on their transformational role from the 1960s to the present. It investigates how Chaebols integrate CSR into their strategic ethos and the government's role in promoting such practices, providing fresh insights into balancing economic growth and social responsibility. This research enriches the academic discourse on CSR and contributes to understanding the nuanced relationship between corporate power, governmental influence, and societal expectations in the modern global economy.

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Sustainable Anti-Consumption of Household Products: A Nepalese Context

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Abstract

Sustainable consumption is the consumer's preference for the products that are environmentally friendly however, non-consumption also plays a major role in sustainability. A counter movement of anti-consumption runs from the beginning of mass-consumption of societies. Consumers can choose not to consume products/brands that can cause a harm to the environment or are incompatible with their ideology on conservation. The underlying notion of these non-consumption practices or anti-consumption is that the consumer is concerned about the effects that a purchasing choice has, not only on themselves but also on the external world. Anti-consumption is a resistance to, distaste of or even resentment of consumption. There is low adaptation rate of green consumption in terms of household products which shows that the non-green consumers reflect the mainstream population and indicates that consumers following anti-consumption is a niche segment reflecting the need of research in this area. So it is consequential to explore the available literatures regarding the subject matter and conduct a quantitative study. Following the notion this paper aims analyzing the factors influencing the anti-consumption behavior of household products in Nepalese context.

***Keywords**: Environment Concern, Anti-consumption, Ethical Consumption, Household Products*

1.Introduction

The hardest thing is to take less when you can get more- Kin Hubbard

Traditionally marketers have been working to encourage shoppers to buy and for many decades these marketers have focused on understanding, segmenting or empirically dissecting a product or brand's existing customer base to identify and grow the customer base. However, as world has moved towards environmental crises and unsustainable patterns, anti-consumption has been emerged as a pivotal movement that advocates for the decrease of unnecessary consumption particularly in household items. Non-consumption plays a major role in sustainability. For example, consumers can choose not to consume products/brands that harm the environment or are incompatible with their ideology on conservation (Sandikci & Ekici, 2009). Anti-consumption refers to being against consumption. As stated by Zavestoski (2002) anti-consumption is a resistance to , distaste of or even resentment or rejection of consumption more generally.

Anti-consumption is not only related to rejecting products but also involves a conscious decision to consume less and choose alternatives that have a lower environmental impact. As stated by Iyer and Muncy (2009) cited as in Ozanne and Ballantine (2010) there are different approaches to anti-consumption and alternative consumption and impetus for anti-consumption vary among political, personal and environmental concerns. Moreover, anti-consumption often focuses on the reduction of all consumption activities it is also possible to focus on the reduction of purchase of specific products and brands. Anti-consumerist movements as boycotts if British goods during the American Revolution and Montgmery bus boycott during US civil rights movement, are somexamples of anti-consumption. Predictors of anti-consumerist attitudes and behaviors at an individual level include concerns about environmental pollution or disruption of ecological balance, a desire to live a simple life, and a belief that a search for happiness should come from internal factors (Yaldir & Ashraf, 2019). Emergence of anti-consumerism is seen as an extension of postmodern society just like excessive consumption which is actually its antithesis. Postmodern society and a number of features distinguishing the individual have contributed to the emergence of anti-consumerism. Another factor contributing to the emergence of anti-consumerism practices is globalization(Ünal & Dalfidan, 2019). Even though most of sustainability studies noted that practices if anti-consumption are most likely to be associated with environmental concerns, some show that anti-consumption can be motivated by individuals prioritizing their self-interests and well- being. For example reducing consumption for voluntary simplifiers is mostly an inner experience driven by a desire to live the good life (Cherrier et al., 2011a).

Anti-consumption as stated by Mukendi et al. (2020) cited as in Vesterinen and Syrjälä, (2022) is one of the radical way to achieve sustainable goals. However, the general notion of anti-consumption defines it simply as the practices of rejecting, reduction and reuse and its conceptual connection to sustainable consumption is far more ambiguous (Cherrier et al., 2011b). Critics of anti-consumerism have accused anti-consumerists of opposing modernity or utilitarianism arguing that it can lead to elitism, primary among libertarian viewpoints, who argue that every person should decide their level of consumption independent of outside influence (Vesterinen & Syrjälä, 2022). Anti consumption is an integral part of trying to live a more sustainable life and in particular the acts of rejecting, reducing and reusing consumption are ley elements of sustainable consumption but the study showed that green consumption whilst practiced is not an essential part of sustainable living (Cherrier et al., 2011b). Following the notion this study attempts to analyze the factors influencing anti-consumption behavior of Nepalese consumers.

2.Literature Sources and Hypothesis Development

Non consumption practices has underlying notion that consumer is concerned with the effects that a purchasing choice has not only on themselves but also on the external world (Harrison et al., 2005). According to Cherrier et al. (2011b) Non-consumption is a broad phenomenon which we classify in three ways (3 I's): "intentional non-consumption" resulting from a decision not to consume something, "incidental non-consumption" resulting from choice towards a preferred alternative (e.g. when a person chooses one brand over others, non-consumption of those unconsidered brands occurs), and "ineligible non-consumption" that results when a person cannot act as a consumer for a particular product (e.g. an underage person not eligible for certain types product/services).

Types of anti-consumers (Iyer & Muncy, 2009)

		Purpose of Anti-Consumption	
		Societal Concerns	Personal Concerns
Object of Anti-Consumption	General (All Consumption)	Global Impact Consumers	Simplifiers
	Specific (Individual Brands or Products)	Market Activists	Anti-Loyal Consumers

General–societal: global impact consumers

Global impact consumers are interested in reducing the general level of consumption for the benefit of society or the planet. They do not believe that the current level of consumption is good for society as a whole. The two most common reasons global impact consumers give for this form of anti-consumption are environmental concerns and material inequity. They hold the belief that the modern consumption of current times is causing irreparable damage to the earth's ecosystem or that over-consumption by the wealthier nations or classes is contributing to poverty problems in lesser developed nations or the poorer classes of society

General–personal: simplifiers

This group wishes to drop out of the fast-paced, high-consumption society and move to a simpler, less consumer oriented lifestyle. They are not the frugal materialists identified by who are reducing consumption in one area to increase consumption in other areas. Neither are they forced by changing economic circumstances to reduce consumption. Rather, they believe that maximizing their consumption, as is commonly done, has undesirable consequences, such as stress and distraction from higher pursuits. There may also be a spiritual or ethical component to the simplifiers' anti-consumption beliefs; they believe that it is morally abhorrent to focus so much energy on self-serving consumption activities (Agarwala, 2019).

Brand–societal: market activists

The market activists who try to use the power of consumer dollars to impact societal issues. Market Activists might avoid using a product or brand because they feel that a specific brand or product causes a specific societal problem (e.g., a product that causes environmental degradation or a brand that encourages negative social behavior).

Brand–personal: anti-loyal consumers

Anti-loyalists are consumers who exhibit the opposite of brand loyalty. Whereas brand loyalty reflects a commitment to repurchase a brand because of its real or imagined superiority (Jacoby, 1978)anti-loyalty reflects a personal commitment to avoid purchasing a product because of perceived inferiority or because of a negative experience associated with it (Lee & Heo, 2009). products that consumers avoid are often as personally and socially important to them as products that they actively seek to purchase. Consumption preferences of the self and of other consumers are important factors in determining an individual consumer's decision to avoid a particular product.

Economic factors and Anti-consumption behavior

Ozanne and Ballantine (2010) found that nearly half of their sample consisted of people that engaged in sharing practices for reasons other than anti-consumption, such as opportunities for socialization and monetary benefits(Chatzidakis & Lee, 2013).

H1: Economic Factors has a significant negative influence on anti-consumption behavior among consumers

Ethical consumption and Anti-consumption behavior

According to (Shaw, n.d.)ethical consumers are surrounded by important decisions of whether to consume with sensitivity through the selection of more ethical alternatives or whether to reduce levels of consumption to a more sustainable level through voluntary simplicity.

H2: Ethical consumption among consumers positively influences anti-consumption behavior

Environment Concern and Anti-consumption Behavior

Anti-consumption lifestyles are voluntarily adopted by individuals who want to reduce the acquisition, use, and disposal of commoditized goods and services (Lee et al. 2011). Because anti-consumption lifestyles are related to reduced consumption overall, the ecological impact of anti-consumers should also be considerably reduced (Nepomuceno and Laroche 2017b cited as in Kropfeld et al., 2018).

H3: Environment concern among consumers positively influences the anti-consumption behavior.

Attitude and Anti consumption behavior

Anti-consumption attitudes are an obvious component of marketing and consumption processes and any consumer who makes a purchase is stating a preference both for one good, and against others (Zavestoski, 2002).

H4a: Attitude of an individual moderates the relationship between economic factors and anti consumption behaviors of house hold products.

H4b: Relationship environment concern and anti-consumption behavior is moderated by attitude.

H4c: Attitude of an individual is moderates the relationship between ethical consumption and anti consumption behavior.

Culture and anti-consumerism

The prominent effective features are supporting a decentralized culture as well as adopting belonging to smaller groups and marketing niche products (Kirmizi & Babaogul, 2012:2 cited as in (Ünal & Dalfidan, 2019).

H5a: Culture mediates the relationship between ethical consumption and anti consumption behavior of consumers.

H5b: Culture intervenes between the economic factors and anti consumption behavior of consumers.

H5c: Culture mediates the relationship between environmental concern and anti consumption of behavior of consumers.

4. Research Methodology

4.1 Sample and Data Collection

The study used quantitative approach using structured questionnaire survey to test hypothesized relationship and research framework. To achieve the objective of the study descriptive and correlational research design was used. Descriptive study design are useful for describing the desired characteristics of the sampled that is being studied (Omair, 2015)that is, case report, case series, correlational, and cross-sectional study designs. The requirements for selecting these study designs are discussed along with the advantages and disadvantages of each study design. The descriptive studies are similar in the context that they are based on a single sample with no comparative group within the study design. Their basic purpose is to describe the characteristics of the sample with regards to the characteristics that are present and so are useful in generating a hypothesis. The absence of a comparative group is the main limitation of the descriptive studies, and this is the reason they cannot be used to determine an association by testing a hypothesis showing a relationship between a risk factor and disease. The analytical study designs will be discussed in the next article in this series."(Omair, 2015. Correlational research design has a conception in which the direction and strength of the relationship between two or more variables with no influence from any extraneous factor is intended to be found (Creswell, Christensen, 2010 2012; Johnson and as cited in Şentürk & Zeybek,). The study concentrates on Nepalese consumers residing in urban areas. Self-administered questionnaire survey was used to collect the data using purposive sampling method. Purposive sampling involves deliberate choice of the informants as they possess the qualities as knowledge or experience (Sekaran, 2006). A pilot study was conducted to check for the understandability and validity of questionnaire beforehand considering the suggestions and some of the wordings and construction of sentences were changed to make it simple and understandable to the respondent. During survey with self-administered questionnaire a valid response of only 235 respondents were recorded. Respondents consisted of male (55.7%), female (44.3 %), age group up to 25 years (39.6%), age group of 26 to 35 years (46.4%), 11.1% from 36 to 45 years (11.1%) and least (3%) were within the age group of 46 and older. Masters level education (60%), bachelor's degree (31.1%), high school level (5.1%) and lowest was respondents having education of MPhil or PhD (3.8%). Annual income level of respondents below 100000 (30.2%), 100000 to 500000 (43.4%) and above 500000 (26.4 %).

4.2 Measures

The measures used for the constructs in the study: environment concern, ethical consumption, economic factors, attitude, culture and anti-consumption behavior which were based on the previous literature available. All measures used for the constructs used in study were measured and were recorded on a five pointed rating Likert scale ranging from 1(strongly agree) to 5(strongly disagree) and responses on demographic variables were recorded using closed ended questions.

4.3 Data Analysis

The data were analyzed using SPSS 23 and AMOS 23 following the guidelines of Anderson and Ginberg (1988) two step model was used: measurement model (to

perform confirmatory factor analysis and for reliability and validity checking among items and constructs) and structural model (for assessing the model fit and hypothesis testing. Different indicators such as chi-square (x2), chi-square to degree of freedom ratio (x2/df), Tucker–Lewis index (TLI), comparative fit index (CFI), goodness-of-fit index (GFI) and root mean square error of approximation (RMSEA) and standardized root mean squared residual (SRMR) were used to measure model fit. An EFA was performed using a principal component analysis and varimax rotation. The minimum factor loading criteria was set to 0.50. The communality of the scale, which specifies the amount of change in each aspect, were also calculated to ensure acceptable levels of clarification. The results showed that all the communalities were over 0.50. An important step involved weighing the overall significance of the correlation matrix is through Barlett's Test of Sphericity, which provides a measure of the statistical probability that the correlation matric has substantial correlations among some of its components. The results were significant, x^2 (n=235) =5360.391(p<0.000), which indicates its suitability for factor analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy (MSA), which indicates the appropriateness of the data for factor analysis was 0.886 as the data with MSA values above 0.80 are considered appropriate for the factor analysis. Finally, the factor solution derived from this yielded factors for the scale, which accounted for 62.61% of variation in the data. Nonetheless, in this initial EFA some items were removed due to low factor loading and not fall on same construct. Further, 62.61% variance was explained by the factors, Bartlett's Test of sphericity proved to be significant for all communalities were over the required value of 0.50. Assessment of the standardized loading showed factor loading and its value between 0.501 to 0.806 which are beyond the suggested value of 0.5 (Hair Jr. et al., 2014) em particular na rea de marketing, pois mais e mais h a necessidade de avaliar vrios constructos e relaes latentes complexas. Tambm, constructos de segunda ordem podem ser modelados fornecendo uma melhor compreenso terica de relaes com boa parcimnia. Modelagens do tipo SEM so, em particular, bem adequadas para investigar as relaes complexas entre os vrios constructos. Os dois mtodos analticos SEM mais prevalentes so os baseados em covarincia SEM (CB-SEM.

Table 1

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.886
Bartlett'3s Test of Sphericity	Approx. Chi-Square	5073.334
	df	820
	Sig.	.000

Table 2

Rotated Component Matrix

	Component									
	1		2		3		4	5			6
EC3	.501	EF1	.600	ECN1	.674	AT4	.697	CUL1	.736	ACB1	.711
EC4	.733	EF2	.665	ECN2	.667	AT5	.641	CUL2	.733	ACB2	.700
EC5	.786	EF3	.787	ECN3	.732	AT6	.738	CUL3	.703	ACB3	.700
EC6	.639	EF5	.681	ECN4	.706	AT7	.802	CUL4	.806	ACB4	.635
EC7	.722	EF6	.545	ECN5	.726	AT8	.650	CUL5	.692	ACB5	.603
EC8	.666			ECN6	.633			CUL6	.773	ACB6	.584
EC9	.784							CUL7	.793		
EC10	.768							CUL8	.690		
								CUL9	.678		
								CUL10	.529		

Internal reliability was assessed by using Cronbach alpha value which ranged from 0.807 to 0.923, that exceeded the threshold of 0.7. Construct Reliability was assessed using Composite reliability, and values ranged from 0.766 to 0.919 of 0.70 to 0.90 representing high reliability (Sideridis et al., 2018), values of composite reliability/Cronbach alpha between 0.60 to 0.70 are acceptable (Ab Hamid et al., 2017). Hence, construct reliability was established for each construct. Convergent validity of scale items was estimated using Average Variance Extracted (Fornell-Larcker criterion) which shows in an average how much variations in the items can be explained by the construct. AVE greater than 0.50 provides empirical evidence for convergent validity (Bagozzi & Yi, 1988). The average variance extracted only for two constructs culture and anti consumption behavior meet the threshold of 0.50 explaining variance of 53.5% by culture and 50.1 % by anti-consumption behavior. Other constructs as environmental concern, economic factors, ethical consumption and attitude showed the lack of convergent (Table 3)

Table 3

Internal Reliability and Convergent Validity

Construct	Item Number(34)	Factor Loading Range	Average Variance Extracted(AVE)	Composite Reliability(CR)	Internal Reliability Cronbach Alpha
Environmental Concern (EC)	8	0.501 – 0.784	0.456	0.869	0.456
Economic Factors(EF)	5	0.545– 0.787	0.398	0.766	0.398
Ethical Consumption(ECN)	6	0.633 – 0.732	0.490	0.851	0.490
Attitude (AT)	5	0.641 – 0.802	0.476	0.818	0.476
Culture (CUL))	10	0.529 – 0.806	0.535	0.919	0.535
Anti-Consumption Brhavior(ACB)	6	0.584– 0.711	0.501	0.800	0.501

Note. Average variance extract, composite reliability and Cronbach alpha values for the constructs.

Source: Author

Table 4

Descriptive Statistics and Discriminant Validity using HTMT Ratio

Construct	Mean	SD	EC	EF	ECN	AT	CUL	ACB
EC	12	4.176						
EF	9.85	2.894	0.294					
ECN	12.03	4.202	0.326	0.661				
AT	11.94	4.059	0.258	0.310	0.417			
CUL	20.93	6.942	0.322	0.353	0.255	0.504		
ACB	7.91	2.648	0.417	0.366	0.515	0.577	0.554	

Note. Hetrotrait monotrait ratio calculation for discriminant validity

Discriminant validity in the study was assessed using Heterotrait- Monotrait (HTMT) Ratio. Table 4 presents descriptive statistics like mean and standard deviation are also provided in where, lowest mean value was seen for anti-consumption behavior and highest for culture. The lowest and highest standard deviation was for anti-consumption behavior and culture respectively. Further, Discriminant Validity when using HTMT ratio, all ratios for constructs were less than the threshold of 0.85 or 0.90 (Henseler et al., 2015) confirming the discriminant validity.

4.4 Measurement and Structural Modeling

Confirmatory Factor Analysis (CFA) was calculated using AMOS to test the measurement models. Due to low factor loading two items EC1, EC2 and EC11 from environmental and societal concern, EF4 from economic factors, AT1, AT2 and AT3 from attitude, ACB4 from anti consumption behavior were removed. The model fit measures were used to measure the model's overall goodness of fit. CMIN, df =1.528, RMR =0.043, GFI = 0.828, AGFI = 0.800, CFI = 0.920, TLI =0.912, RMSEA = 0.048, SRMR =0.057. The model fit for the construct yielded a moderate fit. (P.M. Bentler, 1990; Bentler & Hu, 1998; Hair Jr. et al., 2014; Mia et al., 2019).

Figure 1

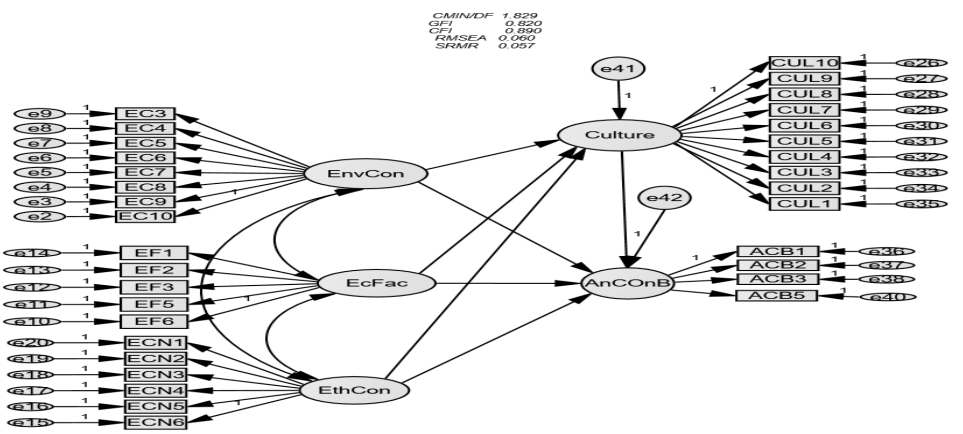

Table 5

Structural Model and Goodness of Fit Model

Model	p-value	χ^2 / d f ≤ 5.00	GFI ≥ 0.80	AGFI ≥ 0.80	CFI ≥ 0.90	TLI ≥ 0.90	RMSEA ≤ 0.05 -0.08	SRMR ≤ 0.08
Measurement	0.00	1.528	0.828	0.800	0.920	0.912	0.048	0.057
Structural	0.00	1.829	0.820	0.792	0.890	0.881	0.060	0.057

Note. Adjusted Goodness-Of-Fit statistic; CFI = comparative fit index; TLI = Tucker-Lewis index; IFI = Incremental Fit Index; RMSEA = Root Mean Square Error of Approximation

Source: Author

A structural equation model generated through AMOS was used to test for the relationships. A good fitting model is accepted if the value of the CMIN/df is < 5, the goodness of fit (GFI) indices is >0.90, the Tucker and Lewis index(TLI), Confirmatory Fit Index(CFI) is >0.90, an adequate fitting model is accepted if the AMOS computed value of the standardized root mean square residual (RMR), 0.05 and the root mean square error approximation (RMSEA) is between 0.05 and 0.08 (Hair Jr. et al., 2014em particular na rea de marketing, pois mais e mais h a necessidade de avaliar vrios constructos e relaes latentes complexas. Tambm, constructos de segunda ordem podem ser modelados fornecendo uma melhor compreenso terica de relaes com boa parcimnia. Modelagens do tipo SEM so, em particular, bem adequadas para investigar as relaes complexas entre os vrios constructos. Os dois mtodos analticos SEM mais prevalentes so os baseados em covarincia SEM (CB-SEM;Bentler & Hu, 1998).The fit indices for the given model were within their respective common acceptance levels. The model for the fit indices yielded an adequate fit for the data: CMIN/df = 1.829, GFI = 0.820, AGFI=0.792, CFI =0.890, TLI=0.881, SRMR = 0.057 and RMSEA = 0.060. The squared multiple correlation was 0.41 for purchase decision which shows 41% variance in the purchase decision accounted by environment and societal concern, quality of product and authenticity of product with mediation of perceived image of firm. The structural model in the study was a good fit but not a perfect fit which may be due to inadequate sample size. For a chi square to be valid the most important assumption is sample size (N) should be sufficiently large and it is believed that fitting a large SEM model (with many observed variables) to moderate or small samples results in biased estimate for chi-square i.e Type I error rate further, chi square test is not always the final world in assessing fit (Shi et al., 2019)the Tucker–Lewis index (TLI. It is difficult to get a non-significant chi-square for sample sizes over 200 or so even other indices suggest a decent fitting model(Usp & Winter, 2012) . Table 6 presents the hypothesis testing of different independent variables on anti-consumption behavior. The impact of economic factors on anti-consumption behavior was non-significant (b=-0.017, t=-0.154, p=0.877>0.05) thus rejecting hypothesis 1, ethical concern on anti-consumption behavior was positive and significant (b=0.275, t=2.322, p=0.020<0.05) supporting hypothesis 2 and influence of environment concern on anti-consumption behavior was positive and significant (b = 0.195, t = 2.652, p =0.008<0.005) supporting hypothesis 3.

Table 6

Hypothesis testing

Relationship	Standardized estimates	t stats	P-value	Decision
Economic factors influences anti-consumption behavior	-0.017	-0.154	0.877	Rejected
Ethical Consumption influences anti-consumption behavior	0.275	2.322	0.020	Accepted
Environment concern influences anti-consumption behavior	0.195	2.652	0.008	Accepted
R Square				
Anti-Consumption Behavior		0.41		
Model Fit				
CMIN/df = 1.829, GFI = 0.820, AGFI=0.792, CFI =0.890, TLI=0.881, RMR=0.045, SRMR = 0.057 and RMSEA = 0.060.				

Source: Author

4.3 Moderation and Mediation Analysis

The study assessed the moderating role of attitude (AT) on the relationship between EC and ACB, ECN and ACB and EF and ACB. For the purpose zstandardized value was calculated in spss and interaction product term between predictor and moderators were calculated. The analysis failed to show any kind of moderating effect between economic factors and anti consumption behavior with attitude as a moderator rejecting hypothesis H4a, similarly, moderation effect of attitude in relationship of environment concern and consumption behavior was significant accepting Hypothesis H4b. Similarly, moderating effect of attitude in relationship between ethical consumption and anti consumption behavior was significant accepting hypothesis H4c (Table 9).

Table 9

Moderation Analysis summary

Relationship	Beta	CR	p-value
EF->ACB	0.033	0.517	0.606
EF*AT->ACB	0.101	1.479	0.141
EC->ACB	0.187	3.282	0.001
EC*AT->ACB	0.116	2.384	0.018
ECN->ACB	0.245	3.630	0.000
ECN*AT->ACB	-0.240	-3.760	0.000
AT->ACB	0.332	5.706	0.000

Note. Moderation effect of attitude

The study analyzed the mediating role of culture on the relationship between EC and ACB, ECN and ACB and EF and ACB. Partial mediating effect of economic factors on anti-consumption behavior via culture was found (b=0.1296, Lower bound = 0.0551 and Upper bound = 0.2305, VAF=48.10%) accepting hypothesis H5a. Similarly, partial mediating effect of culture from ethical consumption to anti-consumption behavior was found (b=0.1122, Lower bound = 0.0544 and Upper bound = 0.1867, VAF=41.00%) supporting hypothesis H5b. Partial mediating effect of environmental concern through culture to anti-consumption behavior was established (b=0.0842, Lower bound = 0.0352 and Upper bound = 0.1461, VAF=39.23%) accepting hypothesis H5c. To be a mediation there should be no zero in between upper bound and lower bound confidence interval and a VAF value more than 0.80 is regarded as full mediation, a VAF value between 0.20 and 0.80 is partial mediation and a value less than 0.20 is regarded as no mediation (Hair Jr. et al., 2014)em particular na rea de marketing, pois mais e mais h a necessidade de avaliar vrios constructos e relaes latentes complexas. Tambm, constructos de segunda ordem podem ser modelados fornecendo uma melhor compreenso terica de relaes com boa parcimnia. Modelagens do tipo SEM so, em particular, bem adequadas para investigar as relaes complexas entre os vrios constructos. Os dois mtodos analticos SEM mais prevalentes so os baseados em covarincia SEM (CB-SEM. Partial mediation effect of culture was seen to mediate between all the independent variables and anti consumption behavior suggesting that the culture that the society members follow intervene the anti consumer behavior. (Table 8)

Table 8

Mediation Analysis

Relationship	Total Effects	Direct Effects	Indirect Effects	VAF	Confidence Interval		conclusions
					Lower bound	Upper bound	
EF->CUL->ACB	0.2694 (0.0000)	0.1398 (0.0107)	0.1296	0.4810	0.0551	0.2305	Partial Mediation
ECN->CUL->ACB	0.2736 (0.0000)	0.1614 (0.0001)	0.1122	0.4100	0.0544	0.1867	Partial Mediation
EC->CUL->ACB	0.2146 (0.0000)	0.1304 (0.0005)	0.0842	0.3923	0.0352	0.1461	Partial Mediation

Note. Mediation analysis of culture (CUL), VAF(Indirect effect/Total Effect)

5. Conclusion and Discussion

Anti-consumption behavior represents a significant and growing movement that challenges the traditional paradigm of consumerism. This behavior encompasses a range of practices aimed at reducing consumption, resisting materialism, and promoting sustainable living. The motivations behind anti-consumption can be diverse as included in the study as environmental concerns, ethical consumption, economic factors, attitude and culture. The findings showed a significant influence of ethical consumption, environmental concern on anti-consumption behavior however, economic factors didn't show any effect. Similarly, moderation effect of attitude an individual factor was only significant for environment concern and anti-consumption behavior and relationship between ethical consumption and anti consumption behavior. However, mediation of culture in all relationship was found which shows that Culture profoundly influences anti-consumption behaviors by shaping values, norms, and practices that either support or resist these behaviors. Understanding the cultural context is essential for promoting anti-consumption practices effectively. By leveraging cultural strengths and addressing cultural barriers, advocates of anti-consumption can foster a more sustainable and mindful approach to consumption globally. Similarly, attitude as an individual factor also influences that anti consumption behavior at an individual level and individuals in the society are the highest consumers of household products. Moreover, anti-consumption behavior often fosters a

deeper sense of personal fulfillment and well-being. By moving away from the relentless pursuit of material goods, individuals can focus on experiences, relationships, and personal growth. This can lead to improved mental health and a greater sense of life satisfaction. Anti-consumption behavior is not merely a trend but a substantive movement with the power to effect meaningful change at both individual and societal levels. It challenges the excesses of modern consumer culture and offers a pathway to a more sustainable, ethical, and fulfilling way of life. Embracing anti-consumption principles can lead to a healthier planet and a more balanced, intentional existence for individuals.

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Role of Digital Transformation in Mountain Tourism for Future Sustainability: A Case Study of Nepal

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Abstract

Digital transformation is reshaping industries worldwide, including the tourism sector. This research focuses on the role of digital transformation in mountain tourism in Nepal, examining how it can drive sustainability and future growth. The study explores the integration of digital technologies in enhancing tourist experiences, improving operational efficiency, and promoting sustainable practices. By employing a mixed-methods approach, including surveys and interviews with stakeholders, this paper provides comprehensive insights into the current state and future prospects of digital transformation in Nepal's mountain tourism industry

Introduction

Mountain tourism is a vital component of Nepal's economy, contributing significantly to employment, income, and cultural preservation. However, the sustainability of this sector faces challenges such as environmental degradation, uneven distribution of benefits, and limited infrastructure. Digital transformation offers promising solutions to address these challenges by leveraging technology to enhance tourist experiences, improve operational efficiencies, andpromote sustainable practices.

Research Objectives

1. To analyze the current state of digital transformation in Nepal's mountain tourism sector.
2. To identify the key drivers and barriers to digital transformation in this context.
3. Evaluate the impact of digital technologies on sustainability practices in mountaintourism.
4. To propose strategic recommendations for enhancing digital transformation to ensurefuture sustainability.

Literature Review

Digital Transformation in Tourism

Digital transformation refers to the integration of digital technologies into all aspects of business operations, fundamentally changing how organizations operate and deliver value to customers. In the tourism industry, digital transformation encompasses various technologies, including mobile applications, social media, big data analytics, and the Internet of Things (IoT), to enhance customer experiences, optimize operations, and support sustainable practices.

Sustainability in Mountain Tourism

Sustainability in tourism involves the balanced integration of economic, social, and environmental dimensions to ensure long-term benefits for all stakeholders. Mountain tourism, characterized by its reliance on natural landscapes and cultural heritage, requires careful management to preserve these resources while supporting local communities.

Digital Transformation and Sustainability

The synergy between digital transformation and sustainability in tourism is increasingly recognized. Technologies such as big data analytics and IoT can monitor environmental impacts,while mobile applications and social media platforms can educate tourists on sustainable practices. Digital platforms also facilitate the promotion of local products and services, contributing to the economic sustainability of mountain communities

Research Method

Research Design

This study employs a mixed-methods approach, combining quantitative and qualitative data to provide a comprehensive analysis of digital transformation in Nepal's mountain tourism sector. The research design includes surveys, interviews, and case studies to capture diverse perspectivesfrom various stakeholders.

Data Collection

Surveys

Surveys were conducted with tourists, tourism operators, and local communities in key mountain tourism destinations in Nepal, including the Annapurna and Everest regions. The survey aimed to gather data on the use of digital technologies, perceptions of their impact on sustainability, and barriers to digital adoption.

Interviews

In-depth interviews were conducted with key stakeholders, including government officials, tourism industry experts,

and technology providers. These interviews provided detailed insights into the strategic and operational aspects of digital transformation in mountain tourism.

Case Studies

Case studies of successful digital transformation initiatives in mountain tourism destinations worldwide were analyzed to draw relevant lessons and best practices for Nepal

Data Analysis

Quantitative data from surveys were analyzed using statistical methods to identify patterns and correlations. Qualitative data from interviews and case studies were analyzed thematically to extract key themes and insights.

Results

Current State of Digital Transformation

The surveys and interviews revealed that digital transformation in Nepal's mountain tourism sectoris in its early stages. Mobile applications and social media platforms are widely used for marketing and communication, but the adoption of advanced technologies such as big data analytics and IoTis limited

Key Drivers and Barrier Driver

Increased Connectivity: Improved internet and mobile connectivity in mountain regionsis a significant driver of digital transformation.

1. Tourist Demand: Increasing demand from tech-savvy tourists for digital services andexperiences.
2. Government Initiatives: Government policies and initiatives promoting digitalization intourism.

Barriers

1. Infrastructure Limitations: Limited infrastructure and technological capabilities inremote mountain areas.
2. Cost and Investment: High costs and investment required for implementing advanceddigital technologies.
3. Skill Gaps: Lack of digital skills and knowledge among tourism operators and local communities.

Impact on Sustainability

The study found that digital transformation has the potential to significantly enhance sustainabilityin mountain tourism by:

1. Environmental Monitoring: Use of IoT and big data analytics to monitor and manage environmental impacts.
2. Sustainable Practices: Mobile applications and social media campaigns promotingsustainable tourism practices.
3. Economic Benefits: Digital platforms facilitating the promotion and sale of local productsand services.

Discussion

Strategic Recommendations

1. Infrastructure Development: Invest in improving digital infrastructure in mountainregions to support the adoption of advanced technologies.
2. Capacity Building: Provide training and education programs to enhance digital skills among tourism operators and local communities.
3. Public-Private Partnerships: Foster collaborations between the government, private sector, and technology providers to drive digital transformation initiatives.
4. Sustainable Tourism Policies: Develop and implement policies that promote the integration of digital technologies in sustainable tourism practices.

Future Research Directions

Future research should focus on longitudinal studies to assess the long-term impacts of digital transformation on sustainability in mountain tourism. Additionally, exploring the role of emerging technologies such as artificial intelligence and blockchain in this context could provide valuable insight

Conclusions

Digital transformation holds significant potential to drive sustainability and future growth in Nepal's mountain tourism sector. By leveraging digital technologies, stakeholders can enhance tourist experiences, improve operational efficiencies, and promote sustainable practices. However, achieving this requires addressing key barriers such as infrastructure limitations, cost, and skill gaps. Strategic investments and collaborations are essential to harness the full potential of digital transformation for the future sustainability of mountain tourism in Nepal.

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Bibliometric Analysis on Green Cosmetic: A Systematic Literature Review and Future Scope

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Abstract

Green cosmetics utilize organic, natural, and renewable ingredients to enhance resource efficiency and minimize waste. Examples of green cosmetics include recycled products and herbal products, which are not only easy to recycle but also contribute to environmental preservation by reducing waste during production. There is a growing trend among consumers and businesses to prioritize environmental sustainability. Embracing eco-friendly products, environmental advocacy, and stringent regulations can lead to a significant reduction in environmental degradation and the adoption of environmentally friendly products by consumers. By conducting a systematic literature review and bibliometric analysis of publications that were published between the years 2003 and 2023, the primary objective of this work is to compile findings on green cosmetics and understandably present them. R studio was utilized in our research to map significant current trends and provide the inside about green cosmetics, and future scope.

Keywords: *green cosmetic, environmental management, bibliometric analysis, R studio, descriptive analysis,*

1. Introduction

Meeting the human needs and wants of consumers in an appropriate manner that does not negatively affect the environment: a green marketing strategy helps to promote sustainability through minimizing the wastage of resources, helps to save the animals, reduces pollution, etc. Furthermore, idea generation, production, packaging, advertising, and transportation can involve different types of activities. However, with the help of green cosmetics, we can achieve sustainability (Bozza et al., 2022). It provides good health to the consumer, helps to save animals, and reduces the impact of chemicals on the consumer's health. Cosmetics play an essential part in modern society. They are defined as "any substance or mixture intended to be placed in contact with the external parts of the human body (epidermis, hair system, nails, lips, and external genital organs) or with the teeth and mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance, protecting them, keeping them in good condition, or correcting body odors" (Bom et al., 2019). The cosmetic industry needs to meet consumer expectations, as a crescent amount of people are slowly shifting mindsets, seeking sustainability through their purchases. There is a need for businesses to manufacture sustainable innovative cosmetic products to meet the highly competitive market advantage and satisfy consumer needs with a health perspective (Amberg & Fogarassy, 2019). This study primarily focuses on introducing the effects of environmental and health awareness trends on the cosmetics industry, for both the producer and consumer sides. Currently, the cosmetics industry offers a variety of Greentech solutions that can be used to produce environmentally friendly natural cosmetics (Amberg & Fogarassy, 2019). There is a multitude of research into the use of new environmentally friendly technological solutions as well. Businesses and governments need to address environmental issues as consumers grow more conscious of how businesses affect the environment, including pollution and climate change (Tengli & Srinivasan, 2022)product quality, and beauty. The presence of harmful chemicals in cosmetics has made consumers realize the importance of being "natural". This paper focused on identifying the factors that influence Indian consumers' purchase intentions and purchase behavior towards natural cosmetics. The

theory of planned behavior (TPB. Changes in consumer belief have accompanied the improvement in sales outlook (Amrina et al., 2021)the dynamic complexity of balancing sustainability efforts, stakeholders' interests, and uncertainty in material pricing require a conceptual reference model to help managers and decision-makers cope with the transition process. This work therefore proposes a model-based strategy using system dynamics to assist managers and stakeholders in SMIs to clarify their possible pathways and to offer a framework to understand, guide, and generate future strategies. In multiactor, multistakeholder conditions, the proposed methodology can provide insights into how stakeholders can effectively intervene to improve sustainability through open innovation dynamics models. The case study presented here on a personal care cosmetics company demonstrates several leverage points and obstacles, thereby allowing each stakeholder to understand their strategic role in realizing sustainable cosmetics SMIs. (Amrina et al., 2021. The consumer demand for healthy and safe products has increased, qualified with the standards, and environmentally. The field of sustainable cosmetics brands is interesting because sustainability is difficult to achieve and frequently requires a significant shift in the way this industry does business. To meet stakeholder expectations, production requirements, and the three levels of sustainability standards, a sustainable cosmetic brand needs to meet challenging criteria. Furthermore, environmentally conscious cosmetics companies look for long-term frameworks and visions that combine strong moral principles with financial success (Dini & Laneri, 2021)much attention is paid to issues such as ecology and sustainability. Many consumers choose \"green cosmetics\", which are environmentally friendly creams, makeup, and beauty products, hoping that they are not harmful to health and reduce pollution. Moreover, the repeated mini-lock downs during the COVID-19 pandemic have fueled the awareness that body beauty is linked to well-being, both external and internal. As a result, consumer preferences for makeup have declined, while those for skincare products have increased. Nutricosmetics, which combines the benefits derived from food supplementation with the advantages of cosmetic treatments to improve the beauty of our body, respond to the new market demands. Food chemistry and cosmetic chemistry come together to promote both inside and outside well-being. A nutricosmetic optimizes the intake of nutritional microelements to meet the needs of the skin and skin appendages, improving their conditions and delaying aging, thus helping to protect the skin from the aging action of environmental factors. Numerous studies in the literature show a significant correlation between the adequate intake of these supplements, improved skin quality (both aesthetic and histological. People are also becoming more conscious, and demanding, and trying to purchase cosmetics more ethically. In this regard, research on sustainable cosmetic brands is intriguing and has both theoretical and practical implications (Gr & Dabija, 2022). The objective of this study is to define the green cosmetic term in sustainability, (2) to identify the most productive country. (3) to identify the most used theory in green cosmetics. (4) To identify the research gap and future scope.

2. Literature review

2.1 Toward the understanding of research of the green cosmetic

Natural ingredient-based cosmetics are referred to as "green cosmetics." A mixture of substances designed to be applied to the teeth or other exterior areas of the body to clean, perfume, alter, or mask body smells, as well as to preserve or maintain their condition, is referred to as a cosmetics product (Limbu et al., 2022). "Green cosmetics," as the term generally refers to cosmetics and personal hygiene items made using ecologically friendly materials and processes. Organic materials, cruelty-free methods, sustainability, and staying away from dangerous chemicals are all frequently linked to green cosmetics (Shimul et al., 2022)the research framework examines consumers' attitude and purchase intention. In addition, the moderating influence of consumer involvement is tested. Data (n = 408. These goods aim to enhance general well-being while reducing their negative effects on the environment. As customers grow more aware of their impact on the environment and the possible health risks associated with some of the components in conventional cosmetics, they are increasingly looking for green cosmetics (Al-Samydai et al., 2020). A greater understanding of environmental concerns may result from more information on relevant topics, which could increase customers' confidence in green products and their comprehension of their attributes. As a result, the increased awareness could support a favorable mindset and a desire to buy such environmentally friendly products. On the other hand, a lack of environmental awareness might hinder customers from utilizing their worries to shape a favorable perception and desire to buy environmentally friendly goods A greater understanding of environmental concerns may result from more information on relevant topics, which could increase customers' confidence in green products and the comprehension of their attributes. As a result, the increased awareness could support a favorable mindset and a desire to buy such environmentally friendly products. On the other hand, a lack of environmental awareness might hinder customers from utilizing their worries to shape a favorable perception and desire to buy environmentally friendly goods (Shimul et al., 2022)**the research framework examines consumers' attitude and purchase intention. In addition, the moderating influence of consumer involvement is tested. Data (n = 408.**

2.2 Green cosmetics and synthetic cosmetics

Synthetic cosmetic

Cosmetics made with different chemical substances are referred to as chemical cosmetics. These substances may be artificially or organically produced. Chemical cosmetics can refer to a broad category of goods, such as skincare, hair care, makeup, scents, and more (Miyanji, 1991). They frequently include active chemicals, colorants, stabilizers, emulsifiers, perfumes, and preservatives that are intended to offer certain cosmetic advantages (Bom et al., 2019). Chemical additives are frequently added to cosmetics to improve their qualities, preserve their effectiveness, and create more marketable products. The inclusion of chemicals such as dioxane, formaldehyde, lead/lead acetate, paraben, and phthalate has raised concerns. Even while these substances are harmful to humans when exposed to high concentrations, the amounts present in cosmetics (Juhász & Marmur, 2014). Chemicals are used in cosmetics to improve effectiveness, safety, stability, and sensory appeal. Preservatives prevent bacteria growth, stabilize formulations, and create desired texture, consistency, and viscosity. Active ingredients like retinoids and antioxidants target specific skin concerns. Chemicals are also used to ensure safety and regulatory compliance, as manufacturers must meet safety standards. Fragrance and aesthetics are enhanced by adding color and UV filters, while functionalism is achieved through emollients and surfactants (Bom et al., 2019). Chemicals also enhance the sensory appeal of products, ensuring they meet safety standards and regulatory requirements.

Green cosmetics

Green cosmetics are undoubtedly a new advantage for the developing nation. Adopting green practices is becoming not only extremely necessary but also a great opportunity for both consumers and enterprises (Santosh Bali & Acharya, 2021). Organic and natural cosmetics are usually associated with the characteristic green (Jaini, 2019) which is used to distinguish items that have an ecological appeal and meet particular production requirements. When it comes to green cosmetics, common claims are those that attest to their creation by the principles of green chemistry (Franca & Ueno, 2020). Utilizing a set of guidelines to reduce or completely eradicate the usage of hazardous substances in the creation, manufacture, and use of chemicals that pose a lesser danger to human and environmental health is known as “green chemistry” (Bozza et al., 2022). Sustainability is a multidimensional and involved topic that encompasses environmental, social, and economic aspects. It was formally defined in the 1987 report “Our Common Future” and is strongly related to green chemistry. According to Brundtland, sustainable development may meet the requirements of the present generation without jeopardizing the ability of future generations to meet their own (Bozza et al., 2022). Green chemistry is a crucial aspect of green cosmetics, promoting environmentally friendly practices throughout the product’s lifecycle. It encourages the use of safer, non-toxic, and biodegradable ingredients, minimizing harm to human health and the environment (Bozza et al., 2022). Green chemistry also promotes resource efficiency, using renewable resources like plant-derived ingredients and bio-based materials. Biodegradable ingredients reduce pollutants and contribute to a healthier ecosystem. Green chemistry minimizes environmental impact by considering factors like toxicity, persistence, and bioaccumulation potential. Green solvents, like water and bio-based ones, are used instead of hazardous ones. Life cycle assessments are integrated into product development, identifying opportunities for improvement (Bom et al., 2019). Green chemistry fosters innovation and collaboration among scientists, researchers, industry stakeholders, and policymakers.

2.3 Sustainability in the Cosmetic Industry

Cosmetics sustainability review, 1988–2018 reviewing Science Direct, Google Scholar, Web of Science, and Scopus yielded 173 papers (Bom et al., 2019). Cosmetic product life cycle and sustainability are covered in this review. The cosmetic industry needs indicators and tools to monitor and assess sustainability (Secchi et al., 2016)following green chemistry principles. A C16-18 triglycerides mixture (INCI name \”palmitic/stearic triglycerides\”. Cosmetic techniques and supply chains can affect sustainability; thus, all processes must respect product life cycles. Design, sourcing, packaging, transfer, manufacturing flexibility (Chowdary & Muthineni, 2012), Consumer use, disposal, and post-use begin product lifespans. Cosmetic Europe-The Personal Care Association 2012b recommends product life cycle thinking for sustainable development evaluation. Product regulation is essential throughout (Bom et al., 2019). (Figure 1). To reduce petrochemical supply and green use, the raw material provider advised the recognized industry to investigate alternative raw materials. Polluting land and marine with cosmetic packaging decreases biodiversity. GMPs for cosmetics production, inspection, storage, and shipping (ISO 22716:2007). Rules cover quality, not environment. Aluminum, glass, paper, plastic, polymers, and hybrid aesthetic packaging affect the environment. Distribution of raw materials, packaging, and finished items is crucial. Fuel distribution releases CO2 and greenhouse gases that warm the globe (Tilikidou & Delistavrou, 2023)modified by climate change risk

perception, in France, Germany, and Spain, to investigate consumers' intentions to purchase personal and house care products that are going to contain innovative ingredients made from recycled CO2. Electronic interviews were undertaken by a research agency on stratified (gender and age. The producer may seem to be responsible for the consumer's consumption phase, but product design and marketing strategies and skills affect consumer interaction (Bom et al., 2019). To reduce environmental impact, packaging waste must be properly treated after use. Reuse, recycling, incineration with energy recovery, and composting are the best waste management methods.

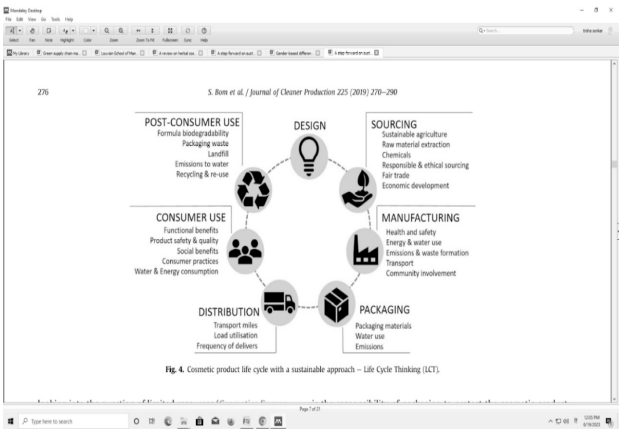

Figure 1 Product lifecycle (Bom et al., 2019)

The European Union discusses cosmetics definitions (2009, p. 64). The author (Vyavhare, 2023) defines herbal cosmetics. (Fonseca-santos et al., 2015) and (Franca & Ueno, 2020) discuss green cosmetics. Organic beauty products (Mcintosh et al., n.d.) (Bom et al., 2019)((Liang et al., 2022)brand themselves as such and develop policies to become inclusive cities. However, knowing what exactly this entails and how it can be achieved is not always quite straightforward and requires thorough theoretical and empirical exploration. Consequently, we present a systematic deconstruction of the inclusive city concept in order to develop a better understanding of the main features and dimensions; this is done by means of both a bibliometric analysis and qualitative literature review. The results indicate that inclusiveness is multidimensional and comprised of spatial, social, environmental, economic, and political dimensions in which the characteristics of participation, equity, accessibility and sustainability are sometimes interwoven. Overall, the inclusive city is not merely a precondition for the creation of just space, well-being, and environmental responsibility, but also an opportunity to take stock of interests of stakeholders in cities and to create local public value. The findings have implications for urban policy and practice, more specifically, the clarification of the inclusive city concept and conceptual dimensions will provide significant reference for policymakers and practitioners to make prudent decisions in the process of creating an inclusive city.""Mapping key features and dimensions of the inclusive city: A systematic bibliometric analysis and literature study" (Liang et al., 2022 European and US FDA regulations govern product manufacturing and marketing to protect human health. Current regulations do not define natural, organic, sustainable, ecological, vegan, or non-toxic cosmetics (Bozza et al., 2022). Green cosmetics were not legally referenced until recently because "natural product claims and conditions were not acknowledged. Certification groups like Icea, Ecocert, Demeter, CCPB, and Cosmos Nature enable enterprises to utilize "ecological, natural, biodegradable, organic, and green" claims for product information, including ingredient management and verification. The ISO 16128: Guidelines on Technical Definition and Criteria for Natural and Organic Ingredient Products standard took years to establish (Bozza et al., 2022).

2.4 Theoretical framework

Theory of planned behavior

Studying green product purchases using planned behavior is common (Pop & Zsuzsa, 2020)Moderating effects and additional components are being studied to improve the model and understand behavior. The planned behavior theory went further than reasoned action by looking at both the involuntary part of resources and opportunities (called perceived behavioral control, or PBC) and the voluntary part (called attitudes or course-related variables of the activity social process, or subjective norms, of behavior. Attitude, norms, and perceived behavioral control positively correlate with green cosmetics purchase intention (GCPI) and behavior (GCPB) (Limbu et al., 2022)This suggests that the theory of planned behavior may help explain consumers' intentions to buy eco-friendly products.

Value-belief norm theory

Developed from environmentalism, the value-belief norm (VBN) theory emphasizes individual attitudes and behavior changes (Stern et al., 1999). The VBN hypothesis states that personal obligation and anticipation drive cause-related action (Hunecke et al., 2001). Stern et al., (1999) state that values, beliefs, and personal norms determine movement support. Stern, (2000) said species-carers worry more about environmental threats to valued goods and personal values drive green behavior. According to the VBN theory, personal norms drive environmentally conscious behavior. Stern et al., (1995) but it has not been placed in the context of a social-psychological theory of attitude formation or attitude-behavior relationships. Using data from a northern Virginia sample, this study examines NEP in relation to the variables in a theoretical model of environmental concern. We found that the NEP is indistinguishable from a scale of awareness of consequences (AC claimed that values and consequences influence environmental norms by encouraging or

discouraging certain behaviors. Kim & Seock, (2009) their perceived importance of product attributes, and their attitude towards and purchase of natural beauty products. This study also examines whether consumers' product attitudes and shopping behaviours are influenced by their health and environmental consciousness. Data were collected from a convenience sample of 210 female college students enrolled at a south-eastern university in the US. In order to examine the impacts of both health and environmental consciousness on other selected variables, the respondents were divided into four groups based on their scores on the two variables, and a series of analysis of variance were conducted to compare characteristics of the four groups. The results showed that health and environmental consciousness significantly influenced the importance placed on beauty product attributes. Additionally, those with a high level of both health and environmental consciousness were significantly more positive in their evaluations than those with low scores on both variables in their perceptions of natural beauty products. Those with low scores on both variables were significantly less willing than the other groups to pay more for natural beauty products. Analysis of variance results also indicated that the two groups with a high level of environmental consciousness purchased natural beauty products more frequently than those with a low level of health and environmental consciousness, indicating a relatively stronger impact of environmental consciousness than health consciousness on frequency of natural beauty product purchases. Health and environmental consciousness were both significantly related to a respondent's perceived level of knowledge of beauty products and ability to distinguish natural from conventional beauty products. © 2009 Blackwell Publishing Ltd." (Kim & Seock, 2009 found that personal beliefs and norms influence pro-environmental behaviour.

Stimulus-organism response theory.

The SOR theory greatly enhances our comprehension of the underlying factors that drive an individual's behavior. Consequently, it is highly pertinent to resolving concerns relating to human behavior. The majority of our conduct is a manifestation of specific inputs that impact our internal emotions. To analyze an individual's behavior, it is necessary to comprehend the impact of various stimuli on their cognitive state. The SOR model was developed by Mehrabian and Russell (1974) through their research on consumer behavior. According to this concept, the environmental stimuli (S) are responsible for inducing two distinct behavioral responses (R)—either approaching or avoiding. These behaviors arise from individuals' internal assessments (O) of various stimuli in the surrounding environment (Donovan & Rossiter, 1982). The Mehrabian-Russell SOR model provides a more effective means of analyzing people's decision-making methods.

3. Research Methodology

Numerous researchers perform literature reviews utilizing a variety of methodologies to comprehend the corresponding findings and organize the previous results. One of the most effective and current ways to implement a simple, methodical, and repeatable literature review procedure based on statistical techniques. This study offers a thorough overview of previous research on the use of green cosmetics methods. As per previous research in the domain (Wang et al., 2018), the investigation utilizes a systematic review methodology. It is a significant and useful tool for summarizing, analyzing, and visualizing published research on the topic. Researchers may obtain reliable data using bibliometric analysis, which may thoroughly evaluate the link between publications (Tang et al., 2018). Consequently, we used the green cosmetic approach to conduct a quantitative analysis of the literature review in this paper.

3.1 Data collection

There are several databases for indexing and abstracting. Subject-based databases such as PubMed, Medline, AGRICOLA, and ERIC, or multidisciplinary databases such as Web of Science and Scopus, are also possible (Thomas, 2021). We utilized the use of Scopus, which provides reliable indexes, summarizes scientific datasets, and has high-caliber articles (Pranckute, 2021). Google Scholar could show discrepancies in citations. Traoré et al., (2023) state that Google Scholar searches more comprehensively than Scopus for conference papers, theses, reviews, book chapters, communications, data works, and unpublished materials. Since Scopus does not own this information, it does not modify these citations in the same way as Google Scholar does. Similar items in Scopus could have been produced by synonyms (Bhardwaj et al., 2023).

3.2 Criteria for inclusion and removal

These recommendations must be adhered to for systematic reviews using PRISMA (Page et al., 2021). PRISMA requires that publications be handled equally but consecutively following the first screening stages. Using keywords, we examined 410 scientific papers from 2003 to 2023 that were collected from Scopus (Figure 2). Using keywords to find, eliminate, and rectify duplicate paper records Examination of studies using inclusion and exclusion criteria Keyword, title, and abstract criteria are used in article refining. From 2003 through 2023, topics included in the course included pharmacology, toxicology, pharmaceuticals, environmental science, business management and accounting, social science, economics, econometrics, finance, multidisciplinary, humanities, and psychology. many document formats, including articles, reviews, conference papers, and published work.

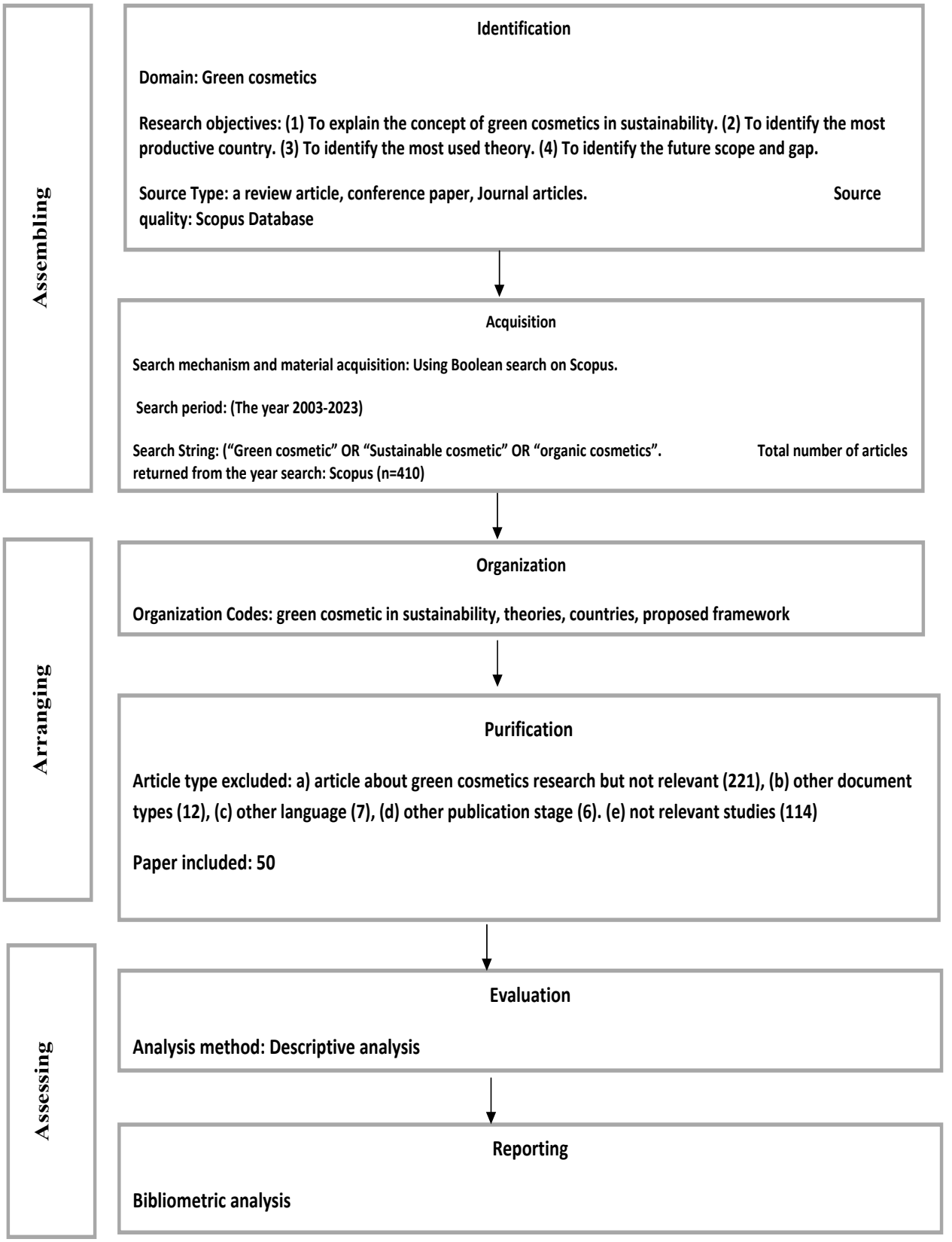

Figure 2 SPAR-4 SLR framework for systematic review

3.3 Systematic analysis

To evaluate the progress made in a specific area of research, the quantity of academic articles that have been published on the topic must be considered (Bhardwaj et al., 2023). The pattern of publications from 2003 to 2023 is shown in Figure 3. Until 2014, the rise in publications remained steady. In Figure 3, two waves are shown. Ten publications constitute the first wave, which was completed in 2015, and 35 publications make up the second wave, which was completed in 2022.

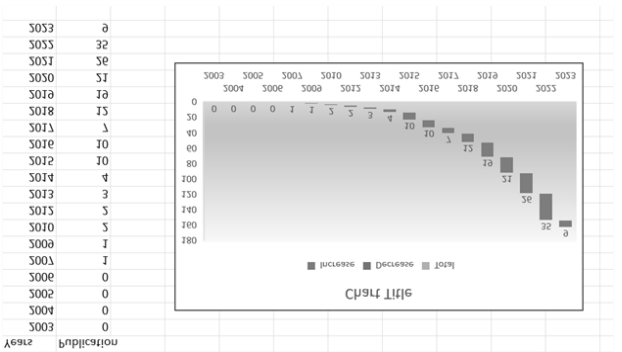

Figure 3 Publication trend

3.4 Three field plots

A three-field plot and Sankey diagram illustrate author, keyword, and nation distributions in Figure 4. The right nodes represent the top 20 countries' contributions and the author's mid-green marketing contribution. Node and edge breadth provide quantitative flow information. It demonstrates how authors, keywords, and countries' research contributions relate (Shah et al., 2023)R Studio program for descriptive analysis and network analysis, to analyze 595 documents from the Web of Science and Scopus data. The study aims to provide a comprehensive overview of the evolution of GHRM and the structures that define it. This article discusses the emerging keywords and research area along with the growth patterns in the area of GHRM during 2002–2022. The findings suggest that publication on GHRM began over 25 years ago and has continued to grow since then. The number of publications in this field of study has doubled over the last 10 years. Emerging themes include Green human resource practices, corporate social responsibility (CSR. This reveals that Nigeria, Poland, Malaysia, and Brazil conduct the most studies. Poland partnered with different authors, whereas France worked with different authors and emerging terms. Each author and country reached the most interesting keyword: "sustainability and cosmetics". The most productive authors are Baby Ar and Bujak T, along with other authors and countries. The figure shows India is not included. In India, green cosmetic research is expanding. India must work more on "green cosmetics" to comprehend sustainability, human welfare, environmental issues, and green economy.

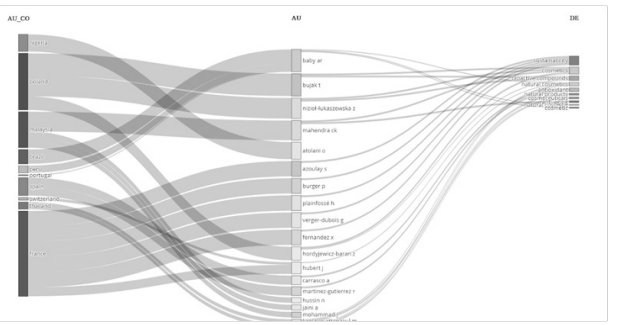

Figure 4 Three field plot

3.5 Countries scientific production

Figure 5 elaborates on a collaboration world map. This map shows that Poland and Malaysia have maximum collaboration on the sustainability subject. The Poland partners with Malaysia, France, and Brazil. It may be possible to visually and interactively examine the geographic distribution of research publications or citations by including a collaborative global map in the bibliometric study. This might help you find new research opportunities, collaborative opportunities, and funding sources. Collaboration globe maps allow for the comparison of research initiatives across several nations or areas.

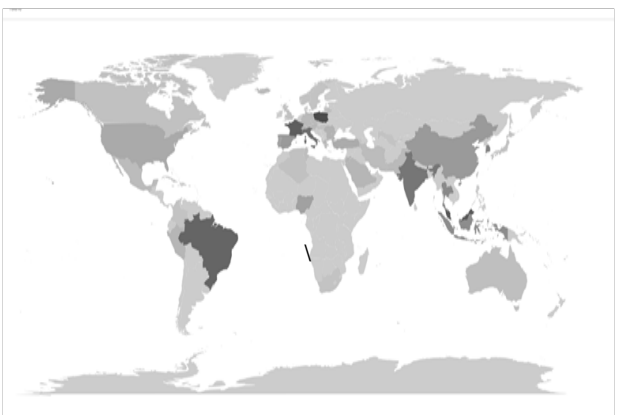

Figure 5 Countries scientific production

3.6 Most relevant affiliation

The term "most relevant affiliation" usually describes an individual's principal or most significant institutional or organizational link within an organization (Bhardwaj et al., 2023). This might relate to their professional associations, such as their primary participation in a society or professional organization relevant to the topic together, their current employment, or the organization they are representing in a specific effort or publication. It may also refer to the organization that they are mostly affiliated with for their work in academic or research environments. In essence, it's the association that matters most or has the greatest influence in the particular circumstance or conversation. The most relevant affiliation is shown in Table 1 and Figure 6.

Table 1 most relevant affiliation

Affiliation	Articles
CHIANG MAI UNIVERSITY	15
UNIVERSITY	15
UNIVERSITY OF SÃO PAULO	15
UNIVERSITY OF INFORMATION TECHNOLOGY AND MANAGEMENT IN RZESZOW	13
DIVISION OF INDUSTRIALIZATION RESEARCH	9
SHANDONG UNIVERSITY OF TRADITIONAL CHINESE MEDICINE	9
UNIVERSIDADE FEDERAL DO RIO DE JANEIRO	9
UNIVERSITI TEKNOLOGI MALAYSIA	9
KYUNG HEE UNIVERSITY	8
MAE FAH LUANG UNIVERSITY	8

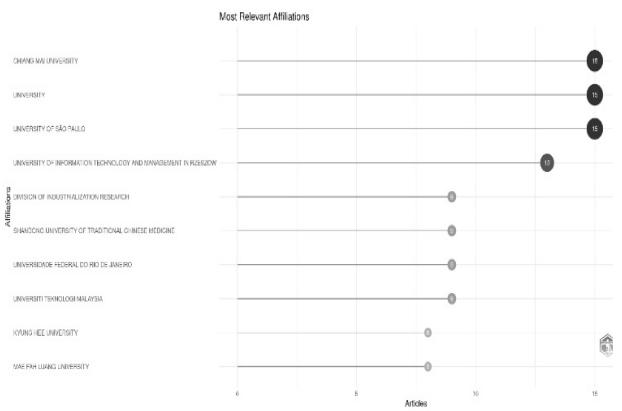

Figure 6 most relevant affiliation

3.7 Most used keywords

Understanding research requires knowledge of its components and terms. Many terms associated with green cosmetics, cosmetics, and green are employed. The identification of keywords and subsequent search for keywords related to that concept constitute a major goal of this study (Bhardwaj et al., 2023). This table (2) contains keywords related to authors and indices. The manuscript's contents are reflected in the author's keywords. Keyword analysis is the process of looking at phrases or keywords in figure (7), that are used in academic papers to identify patterns, trends, and connections within a certain field of study (Ould & Ellili, 2023). This study facilitates the identification of new themes or areas of interest, tracks the evolution of research themes over time, and provides researchers and information workers with insights into the content and emphasis of academic literature. In bibliometrics, keyword analysis is often carried out as follows. Figure 8 represents the keywords consistently used by the researcher in the area of green cosmetics. The blue cluster shows that the word "Cosmetic" is the most used keyword. The cluster suggests the researcher has used the phrases lined to green cosmetics, such as makeup, beauty products, skincare products, and personal care products.

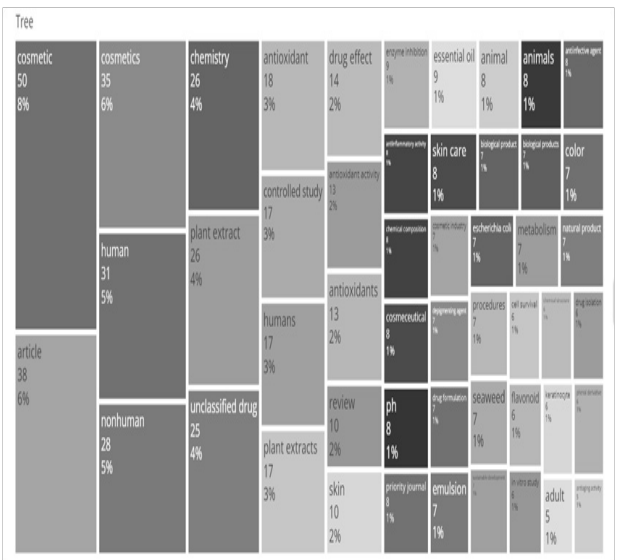

Figure 7 Keyword analysis

Table 2

Terms	Frequency
Cosmetic	50
Article	38
Cosmetics	35
Human	31
Nonhuman	28
Chemistry	26
Plant extract	26
Unclassified drug	25
Antioxidant	18
Controlled study	17

4. Antecedents of green cosmetics

The purchasing decision is greatly influenced by the complex interaction of consumer values, pro-environmental beliefs, and personal norms, particularly when it involves eco-friendly items, sustainable fashion, and green cosmetics. Knowing this connection can allow one to understand why consumers make the decisions they do and how those decisions are changing in response to environmental issues that are becoming more and more pressing. Here's an explanation of how these components work together.

4.1 Values

The fundamental ideas that influence an individual's decisions and behaviors are known as consumer values (Jaini et al., 2020)consumers are moving toward purchasing green cosmetics instead of chemical one. Plenty of cosmetics products are banned globally due to the usage of poisonous substances such as triphenyl phosphate and petroleum. As such, it is needed to shift the conventional purchase behavior to green purchase behavior (GPB. These values, which might include the significance given to social responsibility, ethical production, sustainability, health, and sustainability, are molded by cultural, societal, and personal considerations. Values like altruism (concern for others), biospheric values (concern for the environment), and egoistic values (concern for self-advantage) (Tilikidou & Delistavrou, 2023)modified by climate change risk perception, in France, Germany, and Spain, to investigate consumers' intentions to purchase personal and house care products that are going to contain innovative ingredients made from recycled CO2. Electronic interviews were undertaken by a research agency on stratified (gender and age can have a significant impact on consumer decisions when it comes to pro-environmental conduct. Customers who place a high priority on these principles are more likely to look for and buy goods that they consider to be moral (Suphasomboon & Vassanadumrongdee, 2022).

4.2 Pro-environmental beliefs

Environmental views are the attitudes and opinions people have about the environment and how humans affect it. These beliefs may include appreciating the value of safeguarding the environment, realizing the detrimental effects of pollution and resource depletion, and trusting in the power of human acts to change the world. Strong environmental values increase the likelihood that consumers will be driven to act in ways they believe would improve the environment, such as buying eco-friendly cosmetics or supporting sustainable businesses (Jaini et al., 2020)consumers are moving toward purchasing green cosmetics instead of chemical one. Plenty of cosmetics products are banned globally due to the usage of poisonous substances such as triphenyl phosphate and petroleum. As such, it is needed to shift the conventional purchase behavior to green purchase behavior (GPB.

4.3 Personal norm

The self-imposed guidelines and expectations that people hold themselves to because of their values and beliefs are referred to as personal norms (Nguyen et al., 2019). It is these standards that convert ideals and beliefs into practical actions. Someone who prioritizes sustainability (a consumer value) and thinks trash reduction is important (a pro-environmental view), for instance, can make it a personal habit to stay away from single-use plastics. When it comes to consumer behavior, individual norms determine whether or not a person is prepared to go above and beyond to select items that meet their environmental (Jaini et al., 2020)consumers are moving toward purchasing green cosmetics instead of chemical one. Plenty of cosmetics products are banned globally due to the usage of poisonous substances such as triphenyl phosphate and petroleum. As such, it is needed to shift the conventional purchase behavior to green purchase behavior (GPB, and ethical standards, even if doing so requires paying a higher price or putting in more work.

4.4 Perceived behavior

Perceived behavioral control refers to an individual's assessment of the ease or difficulty of an activity is to perform. According to Shimul et al., (2022)the research framework examines consumers' attitude and purchase intention. In addition, the moderating influence of consumer involvement is tested. Data (n = 408, consumers have challenges or barriers while implementing green consumption, which prevents them from acting appropriately. Furthermore, according to (Cameron et al., 2012), people who believe there are opportunities and that they can get the resources needed to act are likely to have a high degree of perceived behavioral control. For instance, it says that when customers think they have greater resources, such as their feelings of control are strong when time, money, and skills improve, and as a result, their behavioral intentions rise (Li et al., 2012).

4.5 Perceived Quality

Perceived quality is defined as an overall evaluation of a product's or service's quality. It also refers to the perceived quality of a product or service, which may have an impact on customers' decisions to buy (Echchad & Ghaith, 2022). Numerous research has found that consumers' decisions are influenced by their perceived quality of products. Consumers' views toward buying natural products are positively influenced by the perceived quality of organic products in addition to their flavor, freshness, and health benefits (Chen et al., 2014)this paper proves that greenwash negatively impacts green perceived quality and green satisfaction which would positively influence green WOM. This study demonstrates that green perceived quality and green satisfaction mediate the negative relationship between greenwash and green WOM. It means that greenwash does not only have a directly negative effect on green WOM, but also have an indirectly negative effect on it via green perceived quality and green satisfaction. Thus, this study suggests that companies should decrease their greenwash behaviors and enhance their consumers' green perceived quality and green satisfaction to increase their consumers' green WOM. © 2013 Springer Science+Business Media Dordrecht. The influence of greenwash on green word-of-mouth (green WOM. Furthermore, it has been demonstrated by several authors (Jaini, 2019) that consumers are very conscious of product safety. As a result, food safety influences

their purchasing intentions, and they are more likely to purchase organic products as they believe them to be safer than conventional products.

4.6 Attitude

Attitude determines the option to buy. The favorable attitude demonstrates a wise purchasing choice. The ABC theory of attitude holds that a person's attitude affects how they act or respond (Singhal & Malik, 2018). The other is the consistency between attitude and behavior, which has been shown to explain a high correlation between the two. This study suggests that individuals are reasonable and behave logically and that behavior and attitude are consistently consistent. One aspect of consumer behavior is the purchase choice, which is predicted by an individual's attitude (Sajinčič et al., 2021). Numerous studies have demonstrated the importance of attitude toward the environment, or the propensity to assess the natural world with a certain degree of unfavourableness, in predicting pro-environmental behavioral intentions (Tania Vergura -Cristina Zerbini -Beatrice Luceri, 2020) the study investigated whether and how six environmental stimuli related to the consumers' experience with organic personal care products influenced their attitudinal responses (hedonic and utilitarian. A person's knowledge, concern, and desire to take action regarding their health is known as health consciousness, and it has started to get interested as a possible factor in determining greener consumption.

4.7 Knowledge and Awareness

Awareness and knowledge of green cosmetics are crucial factors influencing consumer behavior in the industry. As consumers become more aware of environmental issues, health, and ethical considerations, their interest in green cosmetics has surged. This shift is a reflection of a broader societal move towards sustainability and ethical consumption. Awareness can be influenced by media coverage, social media, marketing campaigns, word of mouth, and educational campaigns (Marangon et al., 2015). Knowledge of green cosmetics includes understanding ingredients, certifications, impact, and brands and products. Higher awareness and knowledge lead to informed decision-making, market demand, reduced greenwashing, and health benefits (Tilikidou & Delistavrou, 2023)modified by climate change risk perception, in France, Germany, and Spain, to investigate consumers' intentions to purchase personal and house care products that are going to contain innovative ingredients made from recycled CO2. Electronic interviews were undertaken by a research agency on stratified (gender and age. Consumers can make healthier choices, reduce greenwashing, and support sustainable brands.

5. Outcome variable of green cosmetics

5.1 Purchasing behavior

Consumers' purchasing behavior toward green cosmetics is influenced by various factors, including environmental concerns, health and safety concerns, ethical considerations, quality and efficacy, personal norms, and social influence (Jaini et al., 2020)consumers are moving toward purchasing green cosmetics instead of chemical one. Plenty of cosmetics products are banned globally due to the usage of poisonous substances such as triphenyl phosphate and petroleum. As such, it is needed to shift the conventional purchase behavior to green purchase behavior (GPB. These factors contribute to the growing demand for sustainable, eco-friendly products, which are perceived as safer and more effective than traditional products (Khan & Salim, 2021). Additionally, consumers' knowledge about green cosmetics, social influence, accessibility and availability, and price sensitivity also play a role in their decision-making process. Understanding these factors can help companies and consumers navigate the challenges of purchasing green cosmetics, promoting sustainability and ethical considerations.

5.2 Purchasing intention

The increasing purchasing intention of green cosmetics is driven by a growing awareness of environmental sustainability and ethical consumption. This trend is driven by factors such as increased consumer awareness of environmental issues, health concerns related to synthetic chemicals, and a growing demand for transparency in product sourcing and production (Khan & Salim, 2021). Green cosmetics, often made with natural, organic, and sustainably sourced ingredients, appeal to environmentally conscious consumers. Health and safety concerns are also driving this trend, with green cosmetics often avoiding controversial ingredients like parabens, phthalates, and synthetic fragrances (Bom et al., 2019). Ethical considerations are also influencing this trend, with cruelty-free and vegan cosmetics gaining popularity. Brands that emphasize fair trade and ethical sourcing of ingredients resonate with this audience. Finally, the effectiveness and quality of green cosmetics have improved over time, with advancements in green ingredients and manufacturing processes enhancing their effectiveness and quality.

5.3 Green purchasing behavior

Green purchasing behavior is a decision-making process that prioritizes the purchase of eco-friendly, sustainable, and ethically sourced products over conventional alternatives. This behavior encompasses a wide range of products, including food, cosmetics, clothing, electronics, and more. The motivation behind green purchasing behavior is multifaceted, involving environmental concerns, health considerations, ethical values, and social status. Key factors influencing green purchasing behavior include environmental awareness, health concerns (Shimul et al., 2022)the research framework examines consumers' attitude and purchase intention. In addition, the moderating influence of consumer involvement is

tested. Data (n = 408, ethical considerations, economic factors, social influences, personal values and identity, information and awareness, and regulatory and policy context (D'Souza et al., 2006)La Trobe University, Bundoora, Australia Mehdi Taghian Deakin Business School, Malvern, Australia Peter Lamb La Trobe University Albury Wodonga, Wodonga, Australia, and Roman Peretiatkos La Trobe University, Bundoora, Australia Abstract Purpose – The purpose of the study is to examine the influence of multiple factors on the green purchase intention of customers in Australia. Design/ methodology/approach – A conceptual model is proposed and was subjected to empirical verification with the use of a survey of metropolitan and regional households in Victoria, Australia. The data were analyzed using both descriptive measures and exploratory factor analysis to identify and validate the items contributing to each component in the model.AMOS structural modeling was used to estimate themeasure of respondents' overall perception of green products and their intention to purchase. Findings – The results indicate that customers' corporate perception with respect to companies placing higher priority on profitability than on reducing pollution and regulatory protection were the significant predictors of customers' negative overall perception toward green products. The only positive contribution to customers' perception was their past experience with the product. Other factors including the perception of green products, product labels, packaging, and product ingredients did not appear to influence customers' perception. The results also indicate that customers are not tolerant of lower quality and higher prices of green products. Research limitations/ implications – The knowledge of the overall perception formation about green products and its predictors provides management with the facility to identify and implement strategies that may better influence the change of attitude by customers. Corporations can also benefit from the identification of the types of information required to enable management to influence this process of perception formation. Originality/value – The present findings contributes to an understanding of the antecedents of green purchasing and highlight that green customers rely more on personal experience with the product than the information provided by the marketer. Keywords Green marketing, Product management, Labelling, Customer satisfaction Paper type Research paper Society",(D'Souza et al., 2006. Consumers with high environmental awareness are more likely to engage in green purchasing, aiming to reduce their ecological footprint by choosing products that are less harmful to the environment. Health concerns, such as avoiding potential toxins in food and cosmetics, also influence the decision to buy green products. Ethical considerations, such as animal welfare, fair labor practices, and worker exploitation, also play a significant role. Economic factors, such as long-term savings and perceived value, can also influence purchasing decisions. Social influences, such as endorsements from influencers or recommendations from peers, can also significantly affect green purchasing. In conclusion, green purchasing behavior is influenced by various factors, including environmental awareness, health concerns, ethical considerations, economic factors, social influences, personal values, information and awareness, and regulatory and policy context.

5.4 Consumption intention

Green consumption intention refers to an individual's commitment to purchasing environmentally friendly products or services. This intention is driven by growing environmental awareness, such as climate change, pollution, and resource depletion. Consumers prioritize factors like sustainable sourcing, minimal packaging, energy efficiency, recyclability, and biodegradability when making purchasing decisions (Bom et al., 2019). They may actively seek eco-friendly products and brands and pay a premium for goods aligning with their environmental values. Factors influencing green consumption intentions include personal values, environmental awareness, social influence, perceived effectiveness of eco-friendly products, and availability of alternatives. Marketing strategies and corporate sustainability initiatives also influence consumer attitudes and behaviors. Businesses are recognizing the importance of catering to green consumption intentions by offering environmentally friendly products and incorporating sustainability into their operations.

5.5 Willing to adapt

Green cosmetics involves embracing innovation, sustainability, and environmentally friendly practices within the industry. Companies can demonstrate their willingness to adapt by exploring new ingredients, developing innovative formulations, investing in sustainable packaging solutions, reducing environmental footprint, and openly communicating with consumers about sustainability efforts (Misra, 2019). These include exploring natural, organic, or sustainably sourced ingredients, developing waterless or solid formulations, and incorporating advanced technologies like microencapsulation. (Farrukh et al., 2022) Sustainable packaging solutions are crucial in green cosmetics, as brands can invest in eco-friendly materials like recycled plastics, glass, bamboo, or compostable alternatives. Innovative packaging designs that minimize waste, optimize space, and enhance product protection can further align with sustainable practices. Reducing environmental footprint throughout the product lifecycle is another important aspect of green cosmetics. Companies can optimize production processes, implement renewable energy sources, and implement waste reduction and recycling programs in manufacturing facilities. Open communication with consumers about sustainability efforts, product innovations, and

environmental initiatives demonstrates a commitment to transparency and accountability (Bom et al.,2019). Continuous improvement in green cosmetics involves regularly reassessing practices, seeking new opportunities for innovation, and adapting to emerging trends and consumer preferences. This might involve conducting lifecycle assessments, collaborating with suppliers, and staying informed about advancements in green technology and regulatory requirements.

6. Discussion

This section of the research shows the overall understanding of the research topic under this section, that's including the previous literature and future scope. The objective of this research is to investigate green cosmetic meaning and sustainability in the cosmetic industry. The cosmetic industry must prioritize adherence to environmentally friendly standards at every stage, from the initial concept of a product to its production, including sourcing raw materials, using eco-friendly machinery, sustainable packaging, green transportation, responsible warehousing, eco-conscious purchasing practices, and post-consumer considerations (Gulati & Singh, 2024). All of these factors play a crucial role in ensuring the sustainability of green cosmetics. Companies are prioritizing sustainable raw materials, using renewable resources, designing biodegradable ingredients, and employing eco-friendly manufacturing processes. They are also reducing packaging waste, investing in renewable energy sources, optimizing water treatment processes, and promoting fair labor practices. Additionally, companies are ensuring transparency and seeking third-party certifications to validate their sustainability claims. By embracing sustainability, cosmetic companies can reduce their environmental footprint, meet consumer expectations, and contribute to a more sustainable future for the cosmetic industry (Tilikidou & Delistavrou, 2023) modified by climate change risk perception, in France, Germany, and Spain, to investigate consumers' intentions to purchase personal and house care products that are going to contain innovative ingredients made from recycled CO2. Electronic interviews were undertaken by a research agency on stratified (gender and age. Natural-based cosmetics are gaining popularity due to the need for safer, more sustainable, and environmentally friendly beauty products. These raw materials, such as plant oils, botanical extracts, clays, minerals, beeswax, essential oils, and fruit and vegetable extracts, offer moisturizing, antioxidant, and anti-inflammatory benefits (Bom et al., 2019). Plant oils like argan, coconut, jojoba, and almond oil are used for their moisturizing properties, while antioxidants like rosehip and grapeseed oil improve skin tone and texture (Gonçalves & Gaivão, 2021)the use of natural and organic cosmetics becomes increasingly important since it is clear that topical treatment with cosmeceuticals can help improve skin rejuvenation. A substantial investigation into the benefits that fruits and plants can bring to health is required. Studies have shown that antigenotoxic properties are linked to anti-aging properties. Several studies have shown potential antigenotoxicity in natural ingredients such as Almonds (Prunus dulcis. Botanical extracts like aloe vera, green tea, and chamomile are used for their healing and calming effects. Essential oils like lavender, tea tree, and peppermint are used for their therapeutic benefits (Przybylska-Balcerek & Stuper-Szablewska, 2019). However, responsible sourcing and proper formulation are crucial for product safety and efficacy. Theory of planned behavior and theory of reasoned most used theory in the field of green cosmetic purchasing behavior (Tilikidou & Delistavrou, 2023; modified by climate change risk perception, in France, Germany, and Spain, to investigate consumers' intentions to purchase personal and house care products that are going to contain innovative ingredients made from recycled CO2. Electronic interviews were undertaken by a research agency on stratified (gender and ageLimbu et al., 2022; Shimul et al., 2022; the research framework examines consumers' attitude and purchase intention. In addition, the moderating influence of consumer involvement is tested. Data (n = 408Delistavrou et al., 2023; although significant technological innovations have been developed. This study examined consumers' intentions to buy innovative cosmetics and detergents containing chemical ingredients made from recycled CO2. An extended by climate change risk perception, TPB model was applied in four European countries. It was found that attitudes, subjective norms and perceived behavioural control mediate the direct relationship between risk perception and intentions to prefer the new, green cosmetics and detergents. Moderated mediation analysis revealed that Germans were found to be more influenced by significant other people. On the contrary, French consumers declared that their own means, opportunities, and convenience matter more strongly in formulating their buying intentions. Greek and Spanish consumers were found to be more or less equally influenced by their perceptions of significant others and their own control over purchasing choices." 2023 Askadilla & Krisjanti, 2017; Delistavrou et al., 2023; although significant technological innovations have been developed. This study examined consumers' intentions to buy innovative cosmetics and detergents containing chemical ingredients made from recycled CO2. An extended by climate change risk perception, TPB model was applied in four European countries. It was found that attitudes, subjective norms and perceived behavioural control mediate the direct relationship between risk perception and intentions to prefer the new, green cosmetics and detergents. Moderated mediation analysis revealed that Germans were found to be more influenced by significant other people. On the contrary, French consumers declared that their own means, opportunities, and convenience matter

more strongly in formulating their buying intentions. Greek and Spanish consumers were found to be more or less equally influenced by their perceptions of significant others and their own control over purchasing choices." (Delistavrou et al., 2023Tengli & Srinivasan, 2022)product quality, and beauty. The presence of harmful chemicals in cosmetics has made consumers realize the importance of being "natural". This paper focused on identifying the factors that influence Indian consumers' purchase intentions and purchase behavior towards natural cosmetics. The theory of planned behavior (TPB. The author, keyword, and country distributions for research on green cosmetics are displayed in the previous section. The countries that carry out the most research include Nigeria, Poland, Malaysia, and Brazil; Poland and France focus on developing new terminology. The most productive authors are Baby Ar and Bujak T. For the sake of sustainability, human well-being, and environmental concerns, India must prioritize green cosmetics. In the preceding section, we thoroughly examined the factors contributing to green cosmetics, including attitude, knowledge, perceived quality, perceived behavior, purchasing intention, purchasing behavior, willingness to adapt, and awareness. These variables are crucial in shaping consumer preferences and can substantially influence the decision-making process when it comes to purchasing green cosmetic products. Figure 8 shows the results-based correlations we observed at different levels with eco-friendly actions. Descriptions of these groups: (1) The government level includes policies and laws promoting environmentally friendly products, including green production standards and rules for green cosmetics. (2) Sustainability is a crucial aspect of enterprise operations, encompassing strategies for sustainability, social responsibilities, payments, and evaluation tools like certificates, indicators, and reports. (3) Consumers are increasingly recognizing the importance of environmental protection, taking responsibility for safe disposal practices, and taking proactive measures post-consumption.

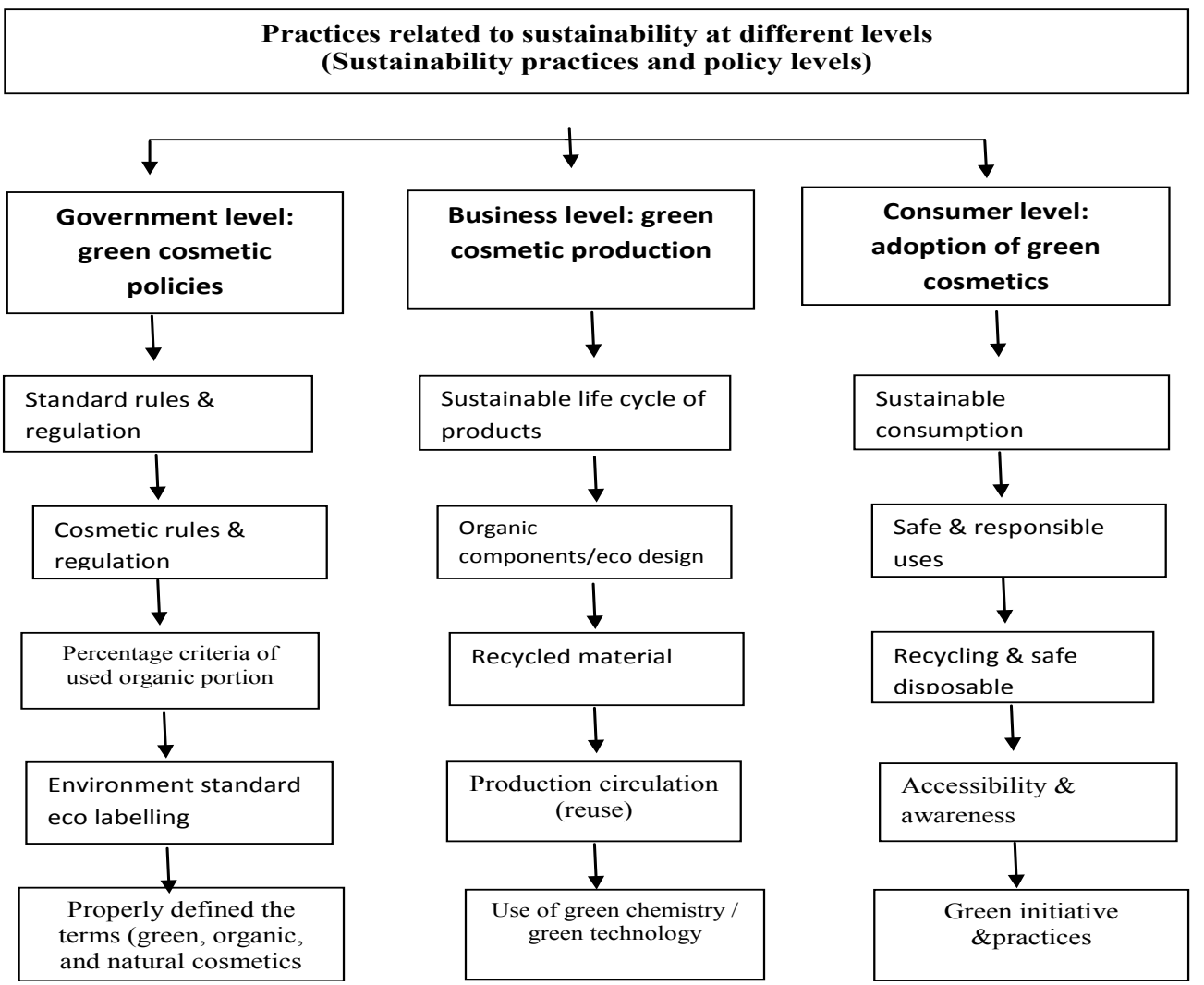

Figure 8 Model

7. Conclusion, Future Scope, and Limitation

The study analyzed the development of research into green cosmetics, using systematic literature review techniques through the SPARK 4 model, and bibliometric analysis tools were used to analyze the keywords, country, and affiliation of Year 2003-2023. This study also aims to find out the gap in green cosmetics and find out the future direction for the research. It's important to understand the differences between green cosmetics and synthetic cosmetics and the specific raw materials used in each. Additionally, delving into the concept of sustainability in green cosmetics and exploring the various types of chemicals used in cosmetic products will provide a more comprehensive understanding of the industry. Keep up the detailed exploration. Firstly, this study goes through the systematic literature review of existing literature and bibliometric analysis on the topic of green cosmetics and finds the discrepancies between them, as well as their limitation. The descriptive analysis of this research indicates that several types of chemicals are utilized in the production of cosmetic products. These chemicals are hazardous to both human health and the environment. Therefore, these chemicals must be replaced with alternatives that are not only organic but also natural. There are several aspects of the product life cycle of green cosmetics that present a significant challenge, including packaging, manufacture, shipping, and storage. The cosmetic industry is embracing sustainability as consumers become more aware of the environmental and social impacts of beauty products. Sustainability practices include sustainable sourcing of raw materials, green chemistry principles, reducing packaging waste, energy efficiency, water conservation, social responsibility, and transparency(Bom et al., 2019). There few keywords which consistently used by the researchers "cosmetics, antioxidant, chemistry" and so on. There is a need to be more investigate the different keywords that give better insight into green cosmetics "plant extract, raw material, green technology, green chemistry, and botanical extract".

Secondly, we found that green cosmetics is a new line into existing literature on the product life cycle of green cosmetics and raw materials of green cosmetics that has gained rapid growth in the fields. Since more and more authors are contributing to its investigation and there is a rising number of scientific publications, the field of study is still in progress. Similarly, using keywords to guide the progression of topics allows us to observe how the collection of knowledge has changed over time. It is crucial to point out the likelihood of future advancements in this field in addition to analyzing the past and current fields. Additionally, the research attempts to provide a conceptual framework for the topic, breaking it down into three main areas. The social structure shows that there is still tremendous space for development in author and nation collaboration, even with an increase in authors, publications, and contributing Countries. We have unified the time frames and the selection of the keywords for research into green cosmetics. We have also used citation databases, Scopus, simultaneously. These methodological adjustments give a much broader perspective on the distribution of research among geographical zones, academic journals, and research institutions, as well as bringing new authors into the conversation. We have offered a new perspective into the field of green cosmetics by investigating the 50 published research articles from the Scopus database. The study aims to guide future scholars in understanding the intellectual structure of the emerging knowledge base in the context of green cosmetics.

Future Scope

Based on the results of the current study and our evaluation, we would like to offer some next research directions. The studies demonstrate that scholars studying green cosmetics are capable of driving and contributing to the construction of strategies based on the themes that are now being explored in the field. One method that may promote green cosmetics, and sustainability, educating youths about environmental values and how to properly handle the interaction between humans and nature. Managers may use this viewpoint to create eco-friendly advertising strategies to target consumer values and beliefs. In the future, it is essential to direct research efforts toward understanding consumer values, including altruistic, biospheric, utilitarian, and eudaimonic values. This will provide valuable insights into consumer purchasing behavior, particularly about green cosmetics. The combination of two different theories of consumer behavior can provide deeper insights into purchasing behavior and help us understand the actual motivations behind consumer purchases. By integrating theories such as the Theory of Planned Behavior and the Consumer Decision-Making Process, we can gain a more comprehensive understanding of how consumers make choices, what factors influence their decisions, and how their attitudes and perceptions shape their purchasing behavior. This integrated approach may offer a more holistic view of consumer behavior, allowing researchers and businesses to better anticipate and respond to consumer needs and preferences. This paper highlights five key forecasts and trends related to green marketing research and future insights: eco-innovation research in emerging and developing nations; low-carbon economies; green consumption; and greenwashing. Exploring the sourcing, sustainability, and environmental impact of raw materials, as well as the extraction process of botanical extracts, analyzing the entire life cycle of green cosmetics from production to disposal, and delving into the principles and applications of green chemistry are all essential areas for further exploration and understandings.

Limitation

The analysis only used Scopus, which may have excluded valuable data from other databases. Additionally, the study's keywords may have eliminated related material from the search. To further comprehend this field's study, future research should explore multiple databases and do more thorough searches. Since Scopus is the most reliable data source, we focused on pharmacology, toxicology, pharmaceuticals, environmental science, business management and accounting, social science, economics, econometrics, finance, multidisciplinary, humanities, and psychology. Articles, reviews, conference papers, and ultimate publication. Additional databases like Web of Science can enrich this study and provide more green cosmetics research knowledge.

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Transforming HR through Design Thinking

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Abstract

Design Thinking is an approach with human-centric mindset that focuses beyond designing programs or processes to create meaningful experiences. It imbues the full spectrum of innovation activities with a human-centered design ethos. By this, it is meant that innovation is powered by a thorough understanding, through direct observation, of what people want and need. In other words, design thinking is a process for creative problem solving which brings an innovative approach that will change the way teams deliver value, organize work and find solutions.

Teams are empowered and accountable to gather user insights and are encouraged to inspire new thinking by discovering what people need. Quite contrary to traditional approach where Teams are not autonomous and need approval of senior management to move forward in every single stage of the project,the results are that when projects are finally ready to be launched, competition has designed something new, as customers need change, or the solution has become obsolete.Furthermore, a Design Thinking framework is not correlative. This means that teams can check with clients or customers and come back to the project to make adjustments to potential prototypes and tests. The initial message here is to create meaningful innovations, teams need to know their customers, or internal clients, very well.

Design Thinking casts HR in a new role. It transforms HR from a process developer into an experience architect. It empowers HR to reimagine every aspect of work: the physical environment; how people meet and interact; how managers spend their time; and how companies select, train, engage, and evaluate people. This core concept is transformational for HR, involving to leave behind annual processes and approach-based planning for a simpler, more innovative and faster model driven by human-centred principles. Early message for HR is that it needs to embed the user or employee at the centre of the experience in its delivery model.

***Keywords:** Innovative approach, Change, Internal clients, Process developer, Experience architect*

Introduction

Design thinking is an approach to creative problem-solving that can stimulate creativity and enable a person to feel capable of coming up with innovative ideas. It incorporates human-centric design with the primary focus with the primary focus on the three intersecting key components – desirability, feasibility and viability. Design thinking connects the desires of people with what is feasible to produce and sustainable for the business. It consists of a process with three phases – inspiration, ideation and implementation. The first phase of inspiration consists of learning and creative processes, which must remain grounded in the desire of people. During the ideation phase, numerous ideas are formed and considered. These ideas are refined in order to build a simple prototype (Carlgren, Rauth and Elmquist, 2016).

This process is broken down into five distinct steps – empathize, define, ideate, prototype and test. In practice, the process of design thinking is not linear, and it unfolds in iterative loops that go back and forth through different

steps. For example, after completing a prototype or draft and demonstrating it to the population or people it is designed for, it may be necessary to go back to ideate different concepts and updates that may be required after obtaining their feedback. If it completely misses the mark of the intended goal, it may be necessary to go back even further to empathize or define step to ensure that the design is truly meeting the needs of the people and the right questions have been asked.Finally, in the implementation phase, partnerships and a business model are formulated to implement the design and get it into use.

Design thinking helps to achievethe balance infeasibility and viability with the needs and desires of people. At an organizational level, human-centred design puts employees at the forefront when trying to solve a problem, and human resource teams are the key drivers. The solution derived to solve that problem should meet the needs of the people. Human-centred design starts with fostering empathy to understand the needs and perspectives of the employees who will ultimately be using or will be impacted by the design. It prioritizes the voices and needs of employees to guide the innovation process and formulate impactful and enduring solutions. In essence, employees become part of the solution and change. They see their voice is being heard and that they have an impact. Instead of something happening to them, it is happening for them (https://designthinking.ideo.com).

Many organizations tend to create programs or policies based on what they think it should be or what they assume people want or need. They do not take a human-centred approach as the guiding principle of their design. Take return-to-office policies as an example. Some organizations make a decision on what they feel that approach should be and implement policies that required employees to return to the office. Many faced harsh backlash and discontent from employees, who questioned the 'why' behind the request, especially if they continued to spend most of their time on virtual meetings.

Design thinking can strongly enhance the improvement of a process or program within an organization. For it to be truly successful, it must be accepted and desired by the people utilizing it. This is where the steps of design thinking to empathize and define are critical. When an organization takes this approach, it ensures that there is an initial deep understanding of what people really need and want. Asking the right questions to assess these needs and interests, the most suitable design, or policy, can be developed. This becomes the core focus of the development of the design without which substantial time and resources are wasted, and the final design is not successful.

The value of design thinking and incorporating this specific approach can be very strategic for HR professionals and organizations alike (Lindsey, 2023). Those who apply design thinking and prioritize a human-centred approach will have a strong competitive advantage by focusing first on understanding the innermost needs and difficulties of their employees and then designing the most optimal solutions. Employees will see firsthand that their voice is heard and that the organisation values and prioritizes what is important to them.

Method

The study has been conducted to understand the perception of people working in a higher education institution to know the role of Design Thinking in changing Human Resource processes in future. The tool developed for data collection wasadministered on 105 people from the population of 500 academicians and non-teaching employees of a higher education institution in India. Analysis of the data is aimed at developing a framework interms of understanding design thinking mindset with special reference to human resources. A scale of 37 statements was developed based on the work of Dosi, Rosati&Vignoli (2018) to revalidate the measure. The scale was found to have the reliability of .90 and validity of .94.

Results

The data was subjected to item-total correlations and one statement was dropped from the initial set of 38 statements. Since all the statements were significantly correlated with the total score in second iteration, thus 37 statements were retained for further analysis (Appendix I). The KMO of .81 and Bartlet's value of .666 were obtained. Thus, all the 37 statements were subjected to Factor Analysis. The results of the first order Factor Analysis were obtained as under:

Factor 1: Optimism

21	I like to implement what I learn	.79
13	I make efforts to have in-depth understanding of the given problem	.77
32	I use my creativity to solve complex problems efficiently	.71
36	I am capable to overcome difficulties	.70
37	I see a problem like an opportunity	.68
19	I like to collaborate with the people from varied backgrounds	.66
15	I share my knowledge with team members	.66
33	I like to think something new which is different from what is already known.	.63
20	I see problem as an opportunity to learn	.62
12	I do not mind to reformulate the initial problem in order to achieve good results	.62
22	I try new things	.60
29	I explore future possibility of a project	.53

Factor 2:Rationality

28	I prefer to simulate alternative solutions	.73
35	I prefer to create value with the final solutions	.50

11	I can understand the impact of proposed solutions	.49
Factor 3: Empathy		
6	I can tune into how concerned stakeholders feel	.67
5	People are source of inspiration which identifying the direction of the design solution	.66
9	I recognize the necessity to emphasize on the particular phase of the process	.57
Factor 4:Orientation to Change		
34	I prefer to change the status quo	.70
31	I look for different outcomes of a project	.62
10	I consider what I am doing from a wider perspective	.53
7	I see problems from the point of view of the stakeholders	.48
Factor 5:Risk Taking		
3	I like taking chances even if it leads me to make mistakes	.74
2	I like taking risks	.70
Factor 6:Collaborative Approach		
16	I work with people who are not from my organization	.83
17	It is preferable to have different competencies in a team	.59
Factor 7:Flexibility		
30	I keep multiple options open at the same time	.73
Factor 8:Novelty		
1	I prefer new contexts rather than familiar ones	.79
8	I look for new discoveries rather than focusing on the outcomes	.67
Factor 9:Team Orientation		
9	I go with the team even ifI have a different opinion	.81
Factor 10:Openness		
18	I do not mind changing my opinion	.82

Thus, the *10 Factors* were: Optimism, Rationality, Empathy, Orientation to Change, Risk Taking, Collaborative Approach, Flexibility, Novelty, Team Orientation, and Openness.

The second order Factor Analysis resulted in the following Dimensions:

Dimension 1: Human Centredness		
Factor 6:	Collaborative Approach	.73
Factor 1:	Optimism	.67
Factor 8:	Novelty	.58
Dimension 2: Learning Orientation		
Factor 5:	Risk Taking	.77
Factor 4:	Orientation to Change	.62
Factor 3:	Empathy	.48
Dimension 3: Rationality		
Factor 2:	Rationality	.78
Dimension 4: Experimentation		
Factor 7:	Flexible	.68
Factor 10:	Openness	.67
Dimension 5:Team Orientation		
Factor 9:	Team Orientation	.89

Correlation between Age and Design Thinking Mindset was found to be 0.012 only. Thus, there is no correlation between Age and Design Thinking Mindset.

Further, difference between the means of Age groups of 24-40 years and 45-68 years was calculated (Table 1).

Table 1 - Details of the Analysis on the basis of Age

	Age Group 24-40 years		**Age Group 45-68 years**		
	n_1 42		**n_2 42**		
	σ_1	σ_2	M_1	M_2	**Z**
DTM	14.15	14.75	150.93	151.12	0.060
Dimension 1	8.80	8.30	76.40	76.80	0.198
Dimension 2	3.90	3.80	35.40	35.04	0.445
Dimension 3	2.60	1.60	16.46	16.30	0.063
Dimension 4	1.39	1.36	7.51	7.49	0.20
Dimension 5	0.80	0.97	3.58	3.87	1.51

Thus, no difference was found in the Mean Scores of DTM and its Dimensions between Age groups of 24-40 years and 45-68 years.

The difference in the Mean Scores of Male and Female respondents was also calculated (Table 2).

Table 2: Details of the Analysis on the basis of Gender

	Gender				
	Male 43 (n_1)		**Female 43 (n_2)**		
	σ_1	σ_2	M_1	M_2	**Z**
DTM	16.90	10.80	153.00	151.73	0.416
Dimension 1	10.30	7.10	89.60	38.50	0.596
Dimension 2	4.10	3.40	35.60	35.50	0.170
Dimension 3	2.20	1.50	16.30	16.69	0.884
Dimension 4	1.40	1.30	7.50	7.40	0.637
Dimension 5	0.87	0.96	3.70	3.60	0.876

Thus, no difference was found in the Mean Scores of DTM and its Dimensions between Male and Female respondents.

Discussion

For more than three decades, design thinking has been used for innovation and problem solving. However, the concept of applying design thinking to human resources is relatively new, asreportedin the organizations like IBM, CISCO and Telstra (Bersin et al., 2016; Elsbach&Stigliani, 2018; Sinha et al., 2020). The success of brands like Apple, Google, Nike, Amazon and PepsiCo has clearly established design thinking as a breakthrough methodology to create products and solutions. Design

thinking is relevant in the context of HR, given that empathy, a core principle of this approach is a much-needed aspect while dealing with the issues and concerns of employees (Chatterjee, 2024).

HR planning involves recruiting, selecting, hiring and training the right candidates to make them ready for the job. Design thinking can optimise the process by incorporating its constituents. Empathy can help recruiters to create a welcoming environment for new recruits. Empathy also helps the HR team to identify any inherent issue, which is a key to innovation. Performance management aims at recognizing the meaningful work that employees do and rewarding that appropriately. Employees often complain about not being recognized for their contribution and HR departments also struggle with the ways of assessing performance. Design thinking can make this process more effective by using tools of surveys to connect and empathise with the employees and understand their concerns and expectations.Design thinking mindset has emerged to have the elements of both left and right brain thinking. Optimism, Rationality, Collaborative Approach and Team Orientation being left brain characteristics, on one hand, and Empathy, Orientation to Change, Risk Taking, Flexibility, Novelty and Openness being right brain characteristics, on the other hand.

The HR department is also responsible for maintaining a harmonious relationship between the employees and the organization. It is often observed that the communication between employees and employers is not very well structured. The lack of a proper communication channel can lead to various issues. The HR team is expected to ensure that both the parties remain well connected and act as a communication enabler between them. Design thinking can enhance this process with all empathy-driven and human centric approach toward the issues that concern both the parties. Compensation and benefits comprise a large part of what HR department handles. Right from the time a candidate joins an organization, gets promoted to the time he/she quits or retires, the HR department reviews and updates his/her compensation. Design thinking can help the HR team to understand the requirements and expectations of the employees and the budget of the employers and optimise the compensation package.

Design thinking is a non-linear iterative process of finding the most human-centric solution for any kind of problem. It works by evaluating and understanding the needs of the stakeholders and finally catering to those needs. The iterative process encourages brainstorming and prototyping to eliminate redundancies and promote the best options. The non-linearity of design thinking is confirmed by its insignificant correlation with age. Design thinking focuses on building a structure, a design for operations which would align the goals of the organisation with its employees. It starts by building the problem statement to find ways of resolving the issues. Today, the environment demands quick solutions and therein lies the challenge. Tim Brown, one of the pioneers of design thinking, believes that 'leading through questions' is the best way to drive innovation. Questions bring us closer to stakeholder requirements and help us understand the scope for improvement.

The goals of human resources are already aligned with design thinking to enhance user experience. It creates opportunities for HR teams to lead a disciplined, streamlined and effective process that addresses employee concerns adequately. It has generated higher levels of employee satisfaction, productivity and engagement. Organizations which put needs of the people and contentment at the core of decision-making become desirable employers to engage their employees and have an edge in attracting talent. Design thinking approach promotes new ways of doing things that positively affect the success of HR system and programs. In fact, a report compiled by Deloitte on *Global Human Capital Trends* showed that the companies where HR conveys the most value are five times more likely to practice design thinking (Boatman, 2024).

Conclusion

The study has revealed that design thinking mindset is constituted of ten factors like Optimism, Rationality, Empathy, Orientation to Change, Risk Taking, Collaborative Approach, Flexibility, Novelty, Team Orientation and Openness, contributing to the five dimensions like Human Centredness, Learning Orientation, Rationality, Experimentation, and Team Orientation. Interestingly, all these factors and dimensions being human-centric, the application of design thinking has a very significant scope in human resource functions. This work has also developed a standardized instrument of 37 statements to facilitate further research and its use in the individual and organizational context. Design thinkingmindset appears to involve whole brain because characteristics of both left and right brain have been found as its constituent factors and dimensions.

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Appendix –I

DTM-Scale

Demographic Information:

Name (Optional): .....
Education: .....

Age: .....
Occupation: .....

Gender: ..... Place of living: .....

Instructions

There are 38 statements in this booklet. They are aimed at measuring the opinion of an individual. You are requested to respond to each statement by writing the number of your choice in parentheses. Please remember that there are no right or wrong answers. The information given by you will be kept completely confidential.

Choice of Response:

1	2	3	4	5
Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree

S. N.	Statements	1 SD	2 D	3 N	4 A	5 SA
1.	I prefer new context rather than familiar ones.					
2.	I like taking risks.					
3.	I like taking chances, even if it leads me to make mistakes.					
4.	I actively involve concerned stakeholders in diverse phases of the design process.					
5.	People are source of inspiration while identifying the direction of the design solution.					
6.	I can tune into how concerned stakeholders feel.					
7.	I see problems from the point of view of concerned stakeholders.					
8.	I look for new discoveries, rather than focusing on the outcomes only.					
9.	I recognize the necessity to emphasize on a particular phase of the process.					
10.	I consider what I am doing from a wider perspective.					
11.	I can understand the impacts of proposed solutions on the external environment.					
12.	I do not mind to reformulate the initial problems in order to achieve good results.					
13.	I make efforts to have in-depth understanding of the given problems.					
14.	I go with the team even if I have a different opinion.					
15.	I share my knowledge with team members.					
16.	I work with people who are not from my organisation.					
17.	It is preferable to have different competencies in a team.					
18.	I do not mind in changing my opinion.					
19.	I like to collaborate with people fromvaried backgrounds.					
20.	I see a problem as an opportunity to learn.					
21.	I like to implement what I learn.					
22.	I try new things.					

S. N.	Statements	1 SD	2 D	3 N	4 A	5 SA
23.	I am convinced thatfailureis important to learn.					
24.	I prefer doing things rather than thinking alone.					
25.	I like to transform ideas into something tangible.					
26.	I look for something novel in a new situation.					
27.	I try to find out what I don't know.					
28.	I prefer to simulate alternative solutions.					
29.	I explore future possibility of a project.					
30.	I keep multiple options open at the same time.					
31.	I look for different outcomes of a project					
32.	I use my creativity to solve complex problemsefficiently.					
33.	I like to think something new, which is different from what is already known.					
34.	I prefer to change the status quo.					
35.	I prefer to create value with the final solution.					
36.	I am capable to overcome difficulties.					
37.	I see a problem like an opportunity.					

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Project-Based Learning through Design Thinking in Statistics Education: An Empirical Study of Thai Undergraduate Students

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Abstract

Statistical knowledge is critical for research, data analysis, and informed decision-making in business. Traditional Lecture-Based Learning (LBL) in statistics often lacks effectiveness in engaging students and fostering practical application skills. Based on a focus group conducted with business entrepreneurs and graduate employers, there is a demand for graduates in statistics who can apply statistical knowledge to solve real-world business challenges. This study developed a new curriculum integrating Project-Based Learning (PBL) and Design Thinking (DT) to address these gaps. The objective of this research is to examine the Thai undergraduate student's motivation between newly designed PBL and DT based statistics course compared to traditional LBL methods. Using a quasi-experimental design with 188 first-year undergraduate students experienced both learning methods. A pre-test and post-test structure measured motivation, creativity and problem-solving skills. Paired t-tests and correlation analysis were employed for data analysis. Findings indicated that the PBL and DT course significantly improved student motivation compared to LBL. The significant positive correlations highlight the effectiveness of the PBL and DT approach in achieving key learning outcomes such as creativity and problem-solving capabilities. This suggests that integrating PBL and DT into statistics education enhances practical application skills and aligns student capabilities with industry expectations.

Keywords: *Project-Based Learning (PBL), Design Thinking (DT), Motivation, ARCS Model*

Introduction

Statistical knowledge is indispensable for conducting research, analyzing data, and making informed decisions in various fields, particularly in business. Traditionally, statistics education has predominantly adhered to a Lecture-Based Learning (LBL) format. While this approach can effectively convey theoretical content, it often falls short in engaging students and fostering the deep, practical understanding needed to apply statistical methods to real-world problems. The studies comparing LBL with more interactive learning methods, such as Problem-Based Learning (PBL), have demonstrated that students in LBL environments report lower levels of engagement and satisfaction (Chang, Zhu, Wen, Song, Zou, & Jin, 2022). Additionally, active learning approaches, which include elements like discussions and hands-on activities, have been found to significantly improve student engagement and practical skills compared to traditional lectures (Delialioğlu, 2012). This challenge is echoed in educational research, which emphasizes the need for more interactive and application-based learning environments (Doppelt, 2009; Goldman, Carroll, & Royalty, 2009).

In Thai government universities, undergraduate programs undergo an exciting transformation every four years, with curriculum revisions designed to keep courses and teaching methods cutting-edge and perfectly aligned with the dynamic needs of the business and industrial sectors. Therefore, the motivation of this research was initiated from focus group discussions with business entrepreneurs

and graduate employers during the survey of needs to improve the curriculum. They were asked to share their expectation about qualification of graduates in statistics. A clear vision for future statistics graduates is not only to gain a deep understanding of statistical principles but also to be able to effectively apply these principles to solve real-world business problems. These insights underscored the limitations of traditional LBL methods and inspired the development of a new statistics course that integrates Project-Based Learning (PBL) and Design Thinking (DT) principles to tackle real-world business challenges.

Design Thinking is increasingly being recognized as a powerful method in education, offering a structured framework for identifying challenges, gathering information, generating potential solutions, refining ideas, and testing solutions. Design Thinking into education provides significant benefits, including enhanced student engagement, improved problem-solving skills, and the development of a growth mindset (Koh et al., 2015; Panke, 2019). This innovative approach aims to enhance student motivation, creativity and problem-solving abilities. Effective curriculum design must foster student motivation and engagement in the subjects they study, as highlighted by Keller's research (John M Keller, ٢٠٠٩). The ARCS model of motivational design, developed by John Keller, offers a comprehensive framework for enhancing learner motivation through Attention, Relevance, Confidence, and Satisfaction (John M. Keller, 1987).

The objective of this research is to examine the student's motivation by comparing the newly designed PBL and DT statistics course compared to traditional LBL methods. The other purpose is to measure learning outcomes through self-assessed creativity and problem-solving capacity in PBL and DT method.

Literature Review

Lecture-Based Learning (LBL) and Project-Based Learning (PBL) represent two distinct pedagogical approaches, each with its own strengths and weaknesses. LBL, a traditional method, focuses on the direct transmission of knowledge from instructor to student, typically through lectures and readings. In contrast, PBL emphasizes active learning where students engage in projects that require critical thinking, problem-solving, and collaboration to address real-world problems. LBL has been a staple in education for centuries and is effective in delivering large amounts of information efficiently (Bligh, 2000). It allows instructors to control the content and pace of learning, ensuring that all necessary material is covered. However, studies have shown that LBL criticized for promoting passive learning, where students are recipients of information rather than active participants in their learning process (Freeman et al., 2014). This method can lead to lower engagement and retention rates, as students may struggle to see the relevance of the material to real-world applications (Prince, 2004). On the other hand, PBL encourages students to take ownership of their learning by engaging them in projects that require critical thinking, collaboration, and the application of knowledge to solve complex problems (Capraro, Capraro, & Morgan, 2013). This hands-on approach not only makes learning more relevant and engaging but also helps students develop essential 21st-century skills such as creativity, communication, and teamwork.

Design Thinking (DT) represents an innovative approach in educational pedagogy, emphasizing active student engagement, creativity, and real-world problem-solving. This pedagogical method aligns with constructivist learning theories, which advocate for student-centered learning environments where knowledge is actively constructed by learners (Yalçın, 2022). When applied in educational settings, Design Thinking fosters a culture of experimentation and resilience, encouraging students to view failure as a learning opportunity (Goldman et al., 2012). Research has demonstrated that PBL, when integrated with Design Thinking, can significantly enhance student engagement and learning outcomes. According to Razzouk (2012), Design Thinking is a user-centered approach to innovation, complements PBL by providing a structured methodology for problem-solving that includes empathizing with users, defining problems, ideating solutions, prototyping, and testing (Razzouk & Shute, 2012). This iterative process helps students develop a growth mindset and enhances their ability to tackle real-world challenges creatively. Empirical studies have provided robust evidence supporting the effectiveness of PBL combined with Design Thinking in various educational contexts. For instance, a study by Doppelt (2009) found that high school students who engaged in PBL projects with a Design Thinking framework showed significant improvements in their problem-solving abilities and scientific inquiry skills compared to those in traditional learning environments (Doppelt, 2009). Additionally, Goldman et al. (2012) highlighted that Design Thinking projects in higher education promote deeper learning and student engagement, as students are motivated by the opportunity to work on meaningful, real-world problems.

The ARCS model, developed by John M. Keller, is a comprehensive framework designed to enhance learner motivation in educational settings. The acronym ARCS stands for Attention, Relevance, Confidence, and Satisfaction, which are the four key components that Keller identifies as essential for motivating learners (John M. Keller, 1987). The first component, Attention, involves capturing and sustaining learners' interest through novel or unexpected events. Second, Relevance is achieved by connecting the learning material to the learners' goals, interests, and experiences thereby making the learning process more meaningful (Jonassen, 1997).

Third, Confidence is built by providing learners with opportunities to succeed and by designing tasks that are appropriately challenging. Finally, Satisfaction involves ensuring that learners feel a sense of accomplishment and reward after completing a task. The ARCS Model provides a valuable framework for understanding and enhancing learner motivation. This model has been widely applied and validated in various educational contexts, demonstrating its efficacy in improving student engagement and learning outcomes. Several studies have validated the use of the ARCS model in educational settings to measure and enhance student motivation. ARCS model was used to measure motivation in a technology-enhanced learning environment(Loorbach, Peters, Karreman, & Steehouder, 2015)

Research Methodology

Participants

This research was conducted with a cohort of 188 first-year undergraduate students enrolled in a statistics course at a university in Bangkok, Thailand. These students were taught using LBL method during the first semester. In the second semester, the same cohort was exposed to a newly designed course integrating PBL and Design Thinking principles. The participants were divided into 20 groups, with each group comprising approximately 9-10 students.

Research Design

The study employed a quasi-experimental design with a pre-test and post-test structure. The first semester served as the control period where traditional LBL methods were used, while the second semester implemented the experimental PBL and Design Thinking-based course. The design aimed to compare student motivation in course between these two teaching methods.

Procedure

1.First Semester (Lecture-Based Learning):

- Students attended regular lectures on statistical concepts.
- Traditional teaching methods were used, including direct instruction, note-taking, and individual assignments.
- At the end of the semester, students were asked to complete a online survey evaluating their motivation with the LBL method.

2. Second Semester (PBL and Design Thinking):

- Empathize Phase:
  - Students were divided into 20 groups and each group selected a business (product or service) to explore.
  - Groups conducted interviews with real consumers to collect qualitative data on pain points related to the chosen product or service.
- Define Phase:
  - Based on the qualitative data, groups identified and defined the main problems faced by consumers.
- Ideate Phase:
  - Students participated in creativity workshops and brainstorming sessions to generate innovative solutions to the identified problems.
  - Groups developed multiple ideas and selected the most promising ones.
- Prototype Phase:
  - Students created tangible prototypes of their solutions.
  - Each group developed two prototypes to address the consumer pain points.
- Test Phase:
  - Students were taught statistical methods for data collection and analysis.
  - Groups designed online questionnaires via Google form to collect data.
  - Prototypes were tested through the surveys to determine which solution was more effective.
- Data Analysis and Presentation:
  - After collecting survey data, students analyzed the results using descriptive statistics.
  - Groups created data visualizations via Google Analytics (Looker).
  - The results of the analysis were be presented to the public at the University Innovation Expo 2023 in Bangkok Thailand.
- Feedback Collection:
  - After the University Innovation Expo 2023, students were asked to complete an online survey that consists of two parts. First part, they were asked to evaluate their motivation with the PBL and Design Thinking course. Second part is self- assessment of their creativity and problem-solving capacities.

Instruments

The survey instrument was designed to measure course motivation by attention, relevance, confidence, and satisfaction using validated items from Keller's ARCS model (John M. Keller, 1987; Loorbach et al., 2015). Moreover, measures of creativity and problem-solving skills in PBL and DT method were included, using scales validated in previous educational research (Tuan, Hanh, & Ninh, 2020). Likert-scale questions (1 to 5) were used in this online survey at the end of semester.

Data Analytics

Descriptive statistics was used to summarize the data and calculation of means, standard deviations, and frequencies

for survey responses. Paired t-tests used to compare the means of ARCS model scores between LBL and PBL with DT. Pearson correlation adopted to assess the relationship between all ARCS components and learning outcomes that measured by creativity& problem-solving capacities. SPSS was used as a statistical software tool for this research analysis.

Research Result

The statistical data for course motivation between Lecture-Based Learning (LBL) and Project-Based Learning (PBL) combined with Design Thinking (DT) are indicated in Table 1. The results of the paired samples t-tests were conducted to compare the students' motivation scores between LBL and the newly implemented PBL& DT. The analysis revealed significant differences in the student's motivation levels between the two learning methods.

Table 1: Motivation paired sample t-test

	M	N	SD	SE	df	t	Sig (2 tailed)
LBL	3.46	188	.772	.056	187	-10.134	.000*
PBL & DT	4.14	188	.616	.045			

* $p < .05$

For the LBL method, the mean motivation score was 3.46 (SD = 0.772). In contrast, the PBL&DT method had a higher mean motivation score of 4.14 (SD = 0.616). The standard error for LBL was 0.056, and for PBL&DT, it was 0.045. The results indicate a statistically significant difference in satisfaction scores between LBL and PBL with DT, with a t-value of -10.134 and a p-value of .000 ($p < 0.05$), suggesting that students reported significantly higher motivation with the PBL&DT approach compared to the traditional LBL method.

Moreover, the paired samples t-tests were conducted to compare each component of the ARCS model (Attention, Relevance, Confidence, and Satisfaction) between the LBL method and the newly implemented PBL&DT as displayed in Table 2. The analysis revealed significant differences in all four components, indicating that the PBL&DT approach significantly improved students' experiences compared to the traditional LBL method.

Table 2: Paired sample t-test for all components

	LBL		PBL&DT				
Motivation	Mean	SD	Mean	SD	df	t	p
Attention	3.33	.888	4.05	.783	187	-9.076	0.000*
Relevance	3.46	.810	3.98	.716	187	-6.762	0.000*
Confidence	3.50	.916	4.20	.747	187	-9.143	0.000*
Satisfaction	3.56	.931	4.32	.734	187	-9.323	0.000*

* $p < .05$

For the Attention component, the mean score for LBL was 3.33 (SD = 0.888), while the mean score for PBL&DT was significantly higher at 4.05 (SD = 0.783). The paired samples t-test showed a statistically significant difference between the two methods, $t(187) = -9.076$, $p < 0.05$. This suggests that the PBL&DT approach was more effective in capturing and maintaining students' attention.

In terms of Relevance, the LBL method had a mean score of 3.46 (SD = 0.810), whereas the PBL&DT method had a mean score of 3.98 (SD = 0.716). The t-test results indicated a significant difference, $t(187) = -6.762$, $p < 0.05$. This indicates that students found the PBL&DT approach to be more relevant to their personal and educational goals.

For the Confidence component, the mean score for LBL was 3.50 (SD = 0.916), compared to a higher mean score of 4.20 (SD = 0.747) for PBL&DT. The t-test showed a significant difference, $t(187) = -9.143$, $p < 0.05$, suggesting that the PBL&DT method significantly enhanced students' confidence in their abilities.

Finally, the Satisfaction component revealed a mean score of 3.56 (SD = 0.931) for LBL, which increased to 4.32 (SD = 0.734) for PBL and DT. The difference was statistically significant, $t(187) = -9.323$, $p < 0.05$. This result indicates that students were significantly more satisfied with the PBL&DT approach compared to the traditional LBL method.

To further understand the impact of the PBL&DT approach on students' motivation and learning outcomes, a Pearson correlation analysis was conducted. This analysis examined the relationships between the four components of the ARCS model (Attention, Relevance, Confidence, and Satisfaction) and the learning outcome, defined as creativity and problem-solving capabilities. The correlation analysis result has been presented in Table 3.

Table 3: Correlation Analysis

Variable	Attention	Relevance	Confidence	Satisfaction	Creativity Problem-solving
Attention	1				
Relevance	.679**	1			
Confidence	.587**	.568**	1		
Satisfaction	.485**	.460**	.681**	1	
Creativity Problem-solving	.449**	.378**	.448**	.417**	1

** Correlation is significant at the 0.01 level (2-tailed)

As result from the table expressed that there is a moderate positive correlation between Attention and Creativity Problem-solving capabilities ($r = .449$, $p < 0.01$). This suggests that when students' attention is effectively

captured and maintained, their ability to think creatively and solve problems improves.

Relevance shows a moderate positive correlation with Creativity Problem-solving ($r = .378$, $p < 0.01$). This indicates that when the learning material is perceived as relevant to students' interests and goals, their creative and problem-solving skills are enhanced.

The correlation between Confidence and Creativity Problem-solving is moderate ($r = .448$, $p < 0.01$). This implies that students who feel confident in their abilities are more likely to engage in creative thinking and effective problem-solving.

Satisfaction also has a moderate positive correlation with Creativity Problem-solving ($r = .417$, $p < 0.01$). This shows that when students are satisfied with their learning experiences, their capability for creativity and problem-solving is positively impacted.

The correlation coefficients indicate significant positive relationships between all ARCS components and the learning outcome, suggesting that improvements in these motivational factors are associated with enhanced creativity and problem-solving skills.

According to this research objectives, the finding indicated that students reported significantly higher motivation with the PBL&DT approach compared to LBL. This underscores the importance of active and experiential learning methods in creating a more engaging and enjoyable educational experience. Furthermore, this study revealed significant improvements in all four components of the ARCS model—Attention, Relevance, Confidence, and Satisfaction—when using the PBL&DT approach. This suggests that integrating these methodologies can effectively address various motivational aspects, leading to a more comprehensive enhancement of the learning process. In addition, the Pearson correlation analysis demonstrated significant positive relationships between the ARCS components and the learning outcome, defined as creativity and problem-solving capabilities. This indicates that improvements in motivation, as measured by the ARCS model, are associated with better learning outcomes.

Conclusion

This study provides compelling evidence that PBL and Design Thinking can transform statistics education by making it more engaging and effective. By fostering a hands-on, real-world learning environment, these methods help students develop creativity and problem-solving skills essential for modern business challenges. In conclusion, the integration of PBL&DT in education offers a powerful framework for enhancing student motivation, creativity and problem-solving skills. While there are challenges to its implementation, the potential benefits for student learning and development make it a promising approach for modern education.

Future research should explore the long-term effects of PBL and DT method on student motivation and learning outcomes across different disciplines and educational levels. Additionally, investigating the interactive effects of the ARCS components and identifying best practices for implementing these methodologies can provide further insights into optimizing educational strategies for maximum impact.

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Uncovering Social Intelligence: A Review

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Abstract

In the increasingly interconnected world, there is a growing relevance of relationship management, interpersonal connections, and cultural awareness; social intelligence, thus emerges as a vital asset for navigating complex relationships, promoting interpersonal understanding, and fostering cultural awareness. The current paper is a synthesis of available literature on social intelligence to enrich academic research, uncover trends and lay a future research direction. The authors, in this study, aim to gain insights into the year wise and journal wise trends into global social intelligence literature along with assessment of India's contribution in the same; further it seeks to synthesize the past literature available on social intelligence. This review employs a bibliometric analysis on 476 articles published in all the ABDC listed journals, analyses 52 articles from A and A category ABDC listed journal for year wise and journal wise trends. Further, it consolidates literature from social intelligence articles to form a comprehensive picture of the construct. Implications in form of policy recommendations, training program and clinical assessments have been suggested and researchers are guided towards further studies.*

Keywords: *social intelligence, bibliometric analysis, review, trend analysis*

Introduction

An often-underestimated concept of the conductor of our social symphony, social intelligence takes the centre stage as we traverse the complexities of increasingly interconnected world in the modern world. We all know that one (or more) person/s that has no difficulty in social situations with their adeptness in understanding, awareness and skilled manoeuvring in social settings they attain this niche in our and other's memory. The conceptualization of social intelligence dates back to the 1920s when Thorndike produced his seminal work Intelligence and its uses. He conceptualized social intelligence as "the ability to understand and manage men and women and boys and girls- to act wisely in human relations." This work marked the increased attention to social intelligence as a concept distinct from mechanical and abstract intelligence. With this began the attempts at assessment of this construct giving rise to assessments that involved data in which the respondents rated themselves or other (Thorndike & Stein, 1937). The failure of the assessment methods eventually resulted in decline in interest in social intelligence as a construct (Walker & Foley, 1973). Vernon (1933), expanded social intelligence as "…social intelligence apparently includes ability to get along with people in general, social technique or ease in society, knowledge of social matters, susceptibility to stimuli from other members of a group, as well as insight into the temporary moods or the underlying personality traits of friends and of strangers".

Walker and Foley (1973) stressed that social intelligence has three conceptual framework that have appeared in the conceptualization of the construct; accurately decoding social information, flexibility and efficacy to refine social performance and thirdly the approaches entailed performance on any test containing the element of social skills. Marlowe's (1986) definition of social intelligence entailed the ability to comprehend the emotions, thoughts and behaviour of oneself and others in relational situation and to act as per the judgement. He suggested five distinct areas to construct social intelligence motivation, self-efficacy in social context, social skills, performance and traits (Ang & Van Dyne, 2015). Further the components of social intelligence were organized into three encompassing dimensions: cognitive, behavioural and motivational dimension (Kosmitzki & John, 1993). According to the viewpoint expressed by Goleman (1998), individuals who possess exceptional social intelligence possess the aptitude to effectively transition and direct their own as

well as others' emotions and attitudes. Silvera et al. (2001) explored social information processing (the cognitive aspect), social skills (the behavioural aspect) and social awareness as three dimensions that constitute the social intelligence and developed a self-administered scale of the same called Tromsø Social Intelligence Scale (TSIS). Babu (2013), stated social intelligence as "the ability to deal efficiently and thoughtfully, keeping one's own identity, employing opposite social inputs with a wider understanding of social environment; considering empathetic co-operation as a base of social acquaintance." Honeywill (2015), proposed that social intelligence consists of a composite level of social and self-awareness, nuanced social views with approaches, willingness and willingness to manifest multifaceted social change.

Objectives

The present academic study has following objectives:

A. To synthesize available social intelligence literature in various influential journals.

B. To understand the year to year and journal to journal distribution of literature in social intelligence.

C. To assess India's position in global contribution to social intelligence literature using bibliometric analysis.

Literature Review

From the vast landscape of human interactions and affiliations, social intelligence has emerged as a multifaceted construct garnering steadily increasing attention from scholars from diverse disciplines. Understanding the nuanced nature of the construct, as we traverse the intricacies of societal structures, cultures, communication and dynamics of relationships, becomes paramount. This literature review embarks on a comprehensive exploration of the construct to uncover empirical insights and conceptual intricacies. From its inception the construct of social intelligence has undergone various rigorous conceptual transformation and has been worked on with varied extensive research methodologies. This review not only serves to synthesize the existing literature but also offers future direction to the new generation of scholars seeking to advance the knowledge on social intelligence. A detailed table of the analysed works is present in the following pages (Table 1) mentioning the authors, sample characteristics, analysis performed, variables studied and most important of all the relevant results.

Author/s	Sample Characteristics	Analysis	Analysed Variables	Relevant Results
(Li et al., 2020)	65 primary participants, including: 46 tourists, 6 DFT operators and 16 tourism and Information and Communication Technology scholars from 11 countries.	Deductive coding approaches were utilised to analyse the textual data.	Character strength (self-regulation, appreciation of beauty and excellence, social intelligence, open mindedness)	In the context of digital-free tourism, social intelligence was observed as a character strength. The importance of face-to-face communication was keenly stressed by younger generation as it involved more eye contacts, subtle changes in tonality, more focus, rich gestures and extended interpersonal exchanges; presenting them the opportunity of improving social intelligence by learning by practicing interpersonal skills.
(Hart et al., 2021)	College students Final N = 309; Mean (age) = 19.01; SD (age) = 1.50	Analysed bivariate relationship among each of the Dark Triad construct Dimensions (Machiavellianism 1. Tactics 2. Views Narcissism 1. Rivalry 2. Admiration Psychopathy 1. Criminal Tendencies 2. Interpersonal manipulation 3. Callous affect 4. Erratic lifestyle)on 1. Gullibility, 2. Benign-authority trust, 3. Stranger trust.	Dark personality, gullibility, dysfunctional trusting, social intelligence	Minimum of one facet of each dark triad construct was found to be associated positively with gullibility and at least one of the dimensions of Machiavellianism or Psychopathy demonstrated a positive association with stranger trust. These observations were found to be mediated by lower social intelligence. Notably, apart from narcissism, each of the dark triad construct had at least one dimension that negatively related with benign-authority trust , although these effects were not found to be mediated by social intelligence.

(Freidlin et al., 2017)	238 participants including 51 men, 187 women Aged between 19–80 Mean (age) = 46.87 SD (age) = 12.77	Obtained data were analysed by employing descriptive statistics, Pearson correlations, a simultaneous linear regression and discriminant analysis.	Social anxiety; Character strengths	It was found that character strength underuse had a stronger relationship with negative outcomes than had overuse. While both underuse and overuse were positively linked to depression, optimal use of character strength pointed to a more flourishing and satisfied life. Furthermore, both underuse and overuse of social intelligence was found associated with social anxiety, suggesting the under awareness and over awareness of socially anxious individuals.
(Loflin & Barry, 2016)	258 adolescents including 217 males, 41 females Age 16-19 years Mean (age)=16.77 years SD (age)=.79	Descriptive statistics, correlations, and a series of multiple regressions using SPSS	Relational Aggression; Social intelligence	Females who reported higher level of social intelligence reportedly engaged higher in RA than males or females with lower reported social intelligence. In terms of similar levels of relational aggression, social intelligence only increased RA for females. Social awareness was found to be related to RA independent of gender pointing to the fact that ability to predict social interactions was a factor in RA.
(Sacco et al., 2016)	150 participants including 75 men 75 women; Mean (age) = 33.56 years SD = 10.81 years	Correlation; Signal detection model (for discrimination power and decision criteria); Regression (for moderators)	Social Intelligence; Emotional Intelligence; Social Perception; Psychopathy Traits	For individuals higher in primary psychopathy, higher level of social intelligence enables discrimination of trustworthiness from untrustworthiness whereas for secondary psychopathy higher levels of both social and emotional intelligence was observed as a protective factor in such discriminations. Additionally, the study reported even though high psychopathy scores reduced sensitivity towards judgement in trustworthiness, yet higher social and emotional intelligence protects such individuals against such lack of insensitivity.
(Brown & Anthony, 1990)	83 undergraduate participants from the Oklahoma State University including 39 Males, 49 Females	Intercorrelation, factor analysis (principal components analysis) Regression analysis	Social Intelligence; Academic Intelligence	The study supports the view that social and academic intelligence are two distinct domains although with partial overlap at times. It also established that social intelligence construct is built up of more than one dimensions including individual's general level of social interest and aptitude, secondly the individual's own assessment of their social skills and interests.

(Katou et al., 2021)	657 employees from 99 organizations with 10+ employees.	Descriptive analysis, multilevel structural equation modelling (MSEM)	Organizational Ambidexterity; Leader's Social Intelligence; Employee work Engagement; Environmental Changes	(1) The study supports the view that leaders with the characteristics of social awareness and relationship management can be seen as facilitators of both exploration and exploitation. leaders with these characteristics develop an ambidexterity-oriented strategy by putting more emphasis on exploration than on exploitation. (2.) The higher impact of Leader's SI for exploration than for exploitation is still supported, although not directly but through work engagement.
(Patel & Poston, 2021)	278 pages of quantitative data, from 19 participants were collected in two phases from Project Managers.	Nvivo, a qualitative software commonly used to organize, analyse, and find insights into unstructured data.	Social Intelligence, Agile Challenges	Managers exhibiting social intelligence could overpower the challenges from stakeholders from both inside and outside the team. Social intelligence equipped the managers the ability to perceive the source of problems including legacy mind-set, lack of trust, uncomfortable interactions and lack of communication.
(Rahim et al., 2015)	406 faculty members from various departments of a large public university in the United States.	Confirmatory Factor Analysis, Structural Equation Modelling	Social Intelligence, Turnover intention	The findings of the study suggest that department chairs' social intelligence has a negative relationship with faculty members' turnover intention, and this relationship is mediated by situational awareness and situational response.
(Hampel et al., 2011)	120 participants form a German University.	The data were analysed using structural equation modelling with robust maximum likelihood estimation (MLMV)	Social Anxiety, Social Intelligence	The study found that social anxiety was negatively related to social intelligence, particularly in the dimensions of social understanding and social memory & perception. The authors also found that the relationship between social anxiety and social intelligence was stronger for publicly observable situations than for private situations.
(Weis & Süß, 2007)	118 participants, including German high school students and first-year psychology students.	The authors used confirmatory factor analysis (CFA) to test their hypotheses and compare different models. They also used multitrait-multimethod (MTMM) analysis to examine the convergent and discriminant validity of the measures.	The study focused on three cognitive ability domains related to social intelligence: social understanding, social memory, and social knowledge.	The authors identified a pure performance model of social intelligence, with three cognitive factors (social understanding, memory, and knowledge) that were positively correlated with each other. The data also pointed an overarching factor suggesting a possible higher-order general social intelligence factor.
(Barnes & Sternberg, 1989)	The study used a sample of 24 undergraduate students from Yale University.	Multiple Regression	Decoding nonverbal cues, Social Intelligence	The study found that decoding skills are an essential component of social intelligence, and different strategies are required for different stimuli.

(Freeman et al., 2016)	The study uses secondary data from multiple sources.	Linear Models, Model Selection Methods	Interpersonal Competence, Social Intelligence and General Ability	Measures of general intelligence (estimated by IQ) and social intelligence (social-cognitive theory of mind – ToM – estimated by agreeableness) have a positive and independent effect on the effectiveness of governance.
(Björkqvist et al., 2000)	The participants were 203 adolescents Mean (age) = 12 years, SD (age)= 0.8	Bivariate and partial correlation	Aggression, Social Intelligence, Empathy	The study found that social intelligence was significantly associated with all types of conflict behaviour, peaceful or aggressive. The strength of social intelligence correlating with indirect aggression, verbal aggression and physical aggression is decreasing in the order they are mentioned.
(Frederiksen et al., 1984)	91 students of 4th year attending medical schools. These schools were situated in the Philadelphia region.	Correlation	Social intelligence, Cognitive abilities.	The associations between verbal ability measures and social intelligence reported in past studies were not established.
(Kosmitzki & John, 1993)	105 students were recruited from a state university.	Factor Analysis	Social Intelligence	Reported that the primary components of social intelligence include behavioural aspects like social adaptability, social skills as well as cognitive aspects such as understanding others, knowing social rules etc.
(Thorndike & Stein, 1937)			Social Intelligence	This paper raised concerns that no test of social intelligence have been sufficiently explored, the George Washington test did not stand strong under experimental conditions and that the methods developed so far were significantly related to abstract intelligence.
(M. I. Brown et al., 2019)	505 participants. Majority of sample were Male (56%) and White (64%)	EFA, CFA, internal consistency reliability analysis, test-retest reliability analysis, and correlation analysis.	Social Intelligence	The Social Shapes Test was found distinct from the types of cognitive ability, although they are related. They form a positive relation with the other existing measures of social intelligence. The SST was found to have minimally to moderately affected by demographic variable, and showed a good convergent and divergent validity in terms of other measures of social intelligence, personality and cognitive abilities.
(Garg et al., 2020)	252 University teachers. Convenience Sampling.	Central tendency, standard deviation, hierarchical regression, correlation, Sobel test and bootstrapping.	Social Intelligence, Leadership, Gratitude	The findings reported partial mediating effect of all three dimensions of social intelligence amidst the relationship of gratitude and leadership.
(Sosik et al., 2012)	The study used a sample of 191 top-level US executives.	Relative Weight Analysis, Multiple Regression	Character strength (integrity, bravery, perspective, social intelligence), performance	The study reported that social intelligence and executive performance are significantly positively related. Social intelligence was found to have a positive relationship with board member- or boss-rated executive performance.

(Speer et al., 2019)	146 participants attended Session-1; 88% of these returned for the completion of the study in Session-2	Correlation, Multiple, Descriptive Statistics, Regression Analysis	Social Intelligence, Interview Accuracy	Social intelligence was found to be positively related to accuracy of judgement within interview settings. Scores from the trait-based measures of social intelligence predicted less accuracy in interview judgement than those of performance-based measures. Social intelligence not only exhibited a positive relationship with evaluation quality of interview questions and their choices but also predicted the accuracy in interview judgement further than the general mental ability.
(Kong, 2015)	40 in depth interview data across Australian NPOs	Qualitative Analysis of Interview Data	Social Intelligence	Social intelligence can stimulate external knowledge acquisition. Additionally, it can have an effect on organizational learning and human capital development. The research also points to the fact that the common understanding of social intelligence is different from the academic literature and a theory-practice divide exists.
(Allan et al., 2017)	324 counsellors from the US. Age: 22-85 years Mean (age)=44.66 SD (age)= 12.84 Female (n = 259) Male (n = 61,) Transgender (n = 2) Genderqueer (n = 2).	Descriptive Statistics, Correlations, Regression, structural equation modelling in MPlus, t-test	Character Strength, Meaningful Work, Burnout	Counsellors reported having higher level of social intelligence.
(Rahim et al., 2018)	A questionnaire was used to collect data on Social Intelligence and Problem Solving from 406 Which was then averaged to form a sample of 43 departments.	The analysis of data was done with SPSS 24 and LISREL 9.2	Social Intelligence, Problem Solving Style	It was reported that the relationships between cognitive empathy and situational awareness, social skills and situational response, and situational awareness and problem-solving style were mediated by social skills, situational awareness and situational response respectively.
(Hoffman & Frost, 2006)	Sample taken over a period of four-years. 86 physicians from an MBA program. 73 Males	Correlation analysis, Multiple hierarchical regressions	Multiple intelligence, leadership	Social intelligence was found to be significantly related to perception of charisma among the subordinates.

Table 1. Overview of literature review.

Research Methodology

This review follows a systematic approach to first, identify and subsequently evaluate and analyze the relevant studies and grasp the holistic understanding of current state of knowledge in the social intelligence arena. To comprehensively analyse and synthesize the literature on social intelligence a systematic research methodology was employed which is detailed in the current section.

Research Design

The current study employs an online search strategy to retrieve relevant literature from online database and reputable journals. Numerous steps were involved between online literature search and finalization of works to be analysed. The analysis performed was limited to papers that have already been published in journals.

Search Strategy

A computerized keyword search was employed on the Scopus database which offers the largest repository of abstracts and citations (Ballew, 2009). The preliminary search string was applied in the title, abstract and keywords fields to retrieve relevant literature.

TITLE-ABS-KEY ("social intelligen*" OR " socially Intellig*" OR "social quotient")

The employed search string retrieved 2459 results.

Selection Criteria

Further, a query string was developed to limit the search to subject areas social sciences, psychology, document type article or review, publication stage as final, source type to journal, publication year between 2011 and 2023 (November) and language to English. The asterisk (*) guided the search to report all matches that began with the letters "intellig" or "intelligen", furthermore AND/ OR operators were used wherever required to generate the sought-after literature.

TITLE-ABS-KEY ("social intelligen*" OR "socially intellig*" OR "social quotient") AND PUBYEAR > 2010 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA , "PSYC") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "BUSI")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re"))

The search string produced 476 documents.

Selection of Papers for Inclusion

The 476 documents' database was subsequently screened to filter out the documents published in reputed ABDC (Australian Business Deans Council) listed journals. The screening narrowed down the database to 52 documents. The documents were further analysed based on their Title and Abstract to gauge their relevance and a total of 18 documents were included in the analysis and later 7 seminal papers were identified through cross-reference and appended in the analysis.

The PRISMA Statement was generated to summarise the identification, inclusion, exclusion criteria and the included works. A PRISMA framework efficiently facilitates a literature study (Moher et al., 2009; Pahlevan-Sharif et al., 2019).

Bibliometric Analysis

Bibliometric analysis has been applied on 476 documents to gauge the global and national trends in the academic exploration of social intelligence. The intention for keeping 476 documents for bibliometric analysis was to gain a richer insight into the publication trends without limiting the database to just ABDC listed journals.

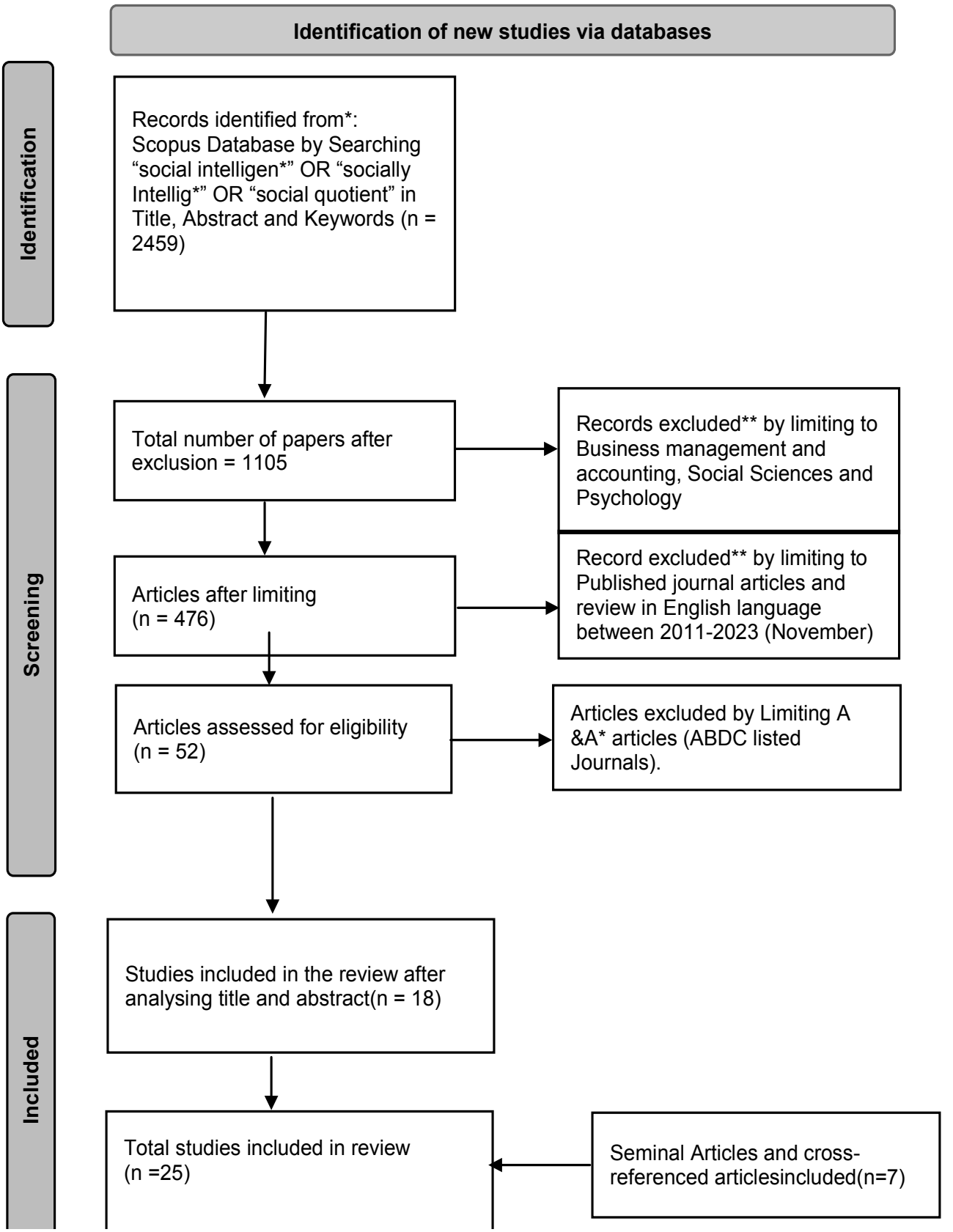

Figure 1. PRISMA Framework

The 52 shortlisted papers were analysed using Microsoft Excel to garner insights into year wise and journal wise publication trends. The literature review was carried out on the final 25 selected papers by tabulating the data from the published reports and trends were extrapolated.

Results

The sorted 52 papers were analysed, and their journal-wise & year by year distribution is graphically represented with further elaboration. Moreover 476 articles' attributes were fed into bibliometric analysis. This section details the results obtained.

Journal Wise Distribution of the Papers

Referring to Figure 2, the distribution of social intelligence research across various academic journals reflects the multidisciplinary nature and broad applicability of this construct. "Personality and Individual differences", an A* category journal in ABDC list, stands as the torchbearer of research in the field of social psychology with 13 papers published out of 52. It accounts for 25% share of all the works published. "Decision Support Systems", "International Journal of Selection and Assessment", "Journal of Business Research" and "Journal of Computer Information Systems" published 3 research reports each out if 52 which accounts for 5.7% share of all the works published each. Four journals viz, "Journal of Business Ethics", "Journal of Personality and Social Psychology", "Technological Forecasting and Social Change" and "Journal of Personality Assessment" reported publishing 2 papers each, which makes a 3.8% share of all the 52 published works. Furthermore, the remaining journals in the list have each made a singular contribution to the examined construct, emphasizing a broader engagement with the subject matter across a diverse range of academic publications. This diverse journal-wise distribution underscores the interdisciplinary nature of social intelligence research, spanning fields from psychology and marketing to technology and environmental science. The comprehensive exploration of social intelligence across these journals contributes to a richer and more nuanced understanding of this multifaceted construct.

Year Wise Distribution of the literature

The year by year analysis of publication trends (Figure 3) provides insights in the dynamic landscape of inquiry in social intelligence. The nascent stage of academic inquiry is visible in initial years with a modest one paper a year output. Subsequently, there was a growth trend with 5 papers in 2013 and 2014 which rose to 6 publications in year 2016. A short-lived decline is seen in 2017 which further catches up with a notable surge to 8 articles in 2022.

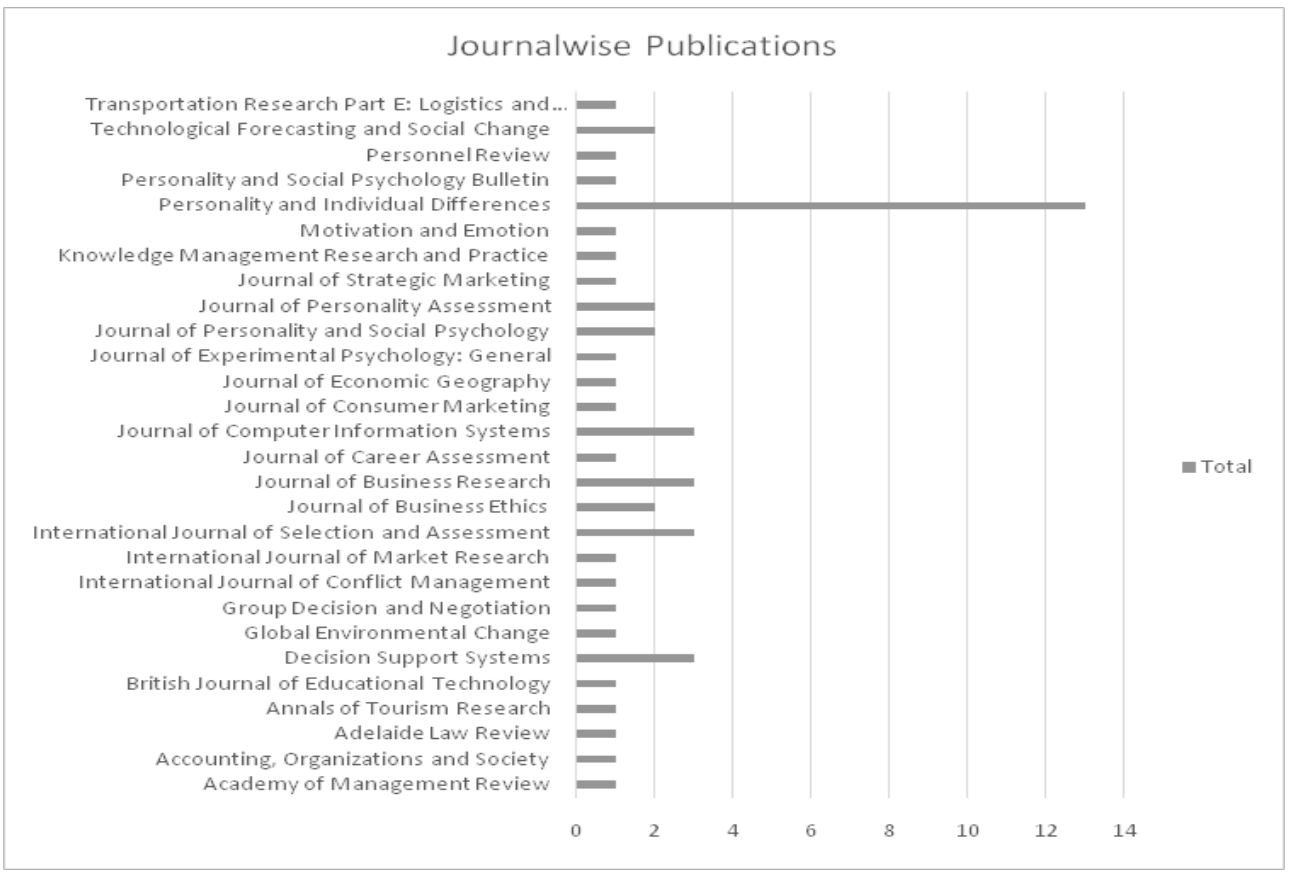

Figure 2. Journal-wise Distribution of Papers on Social Intelligence.

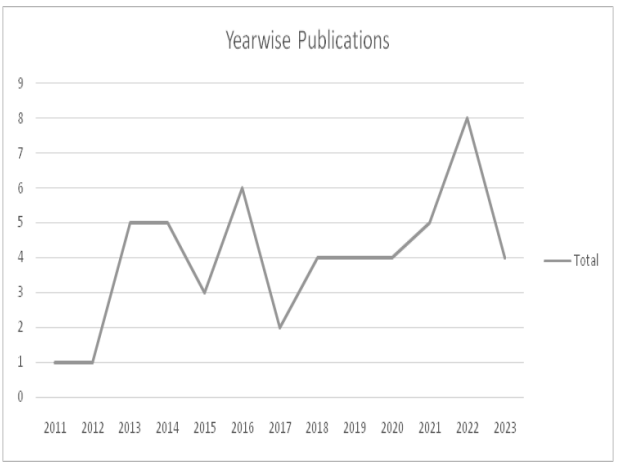

Figure 3. Year Wise Distribution of the literature on Social Intelligence.

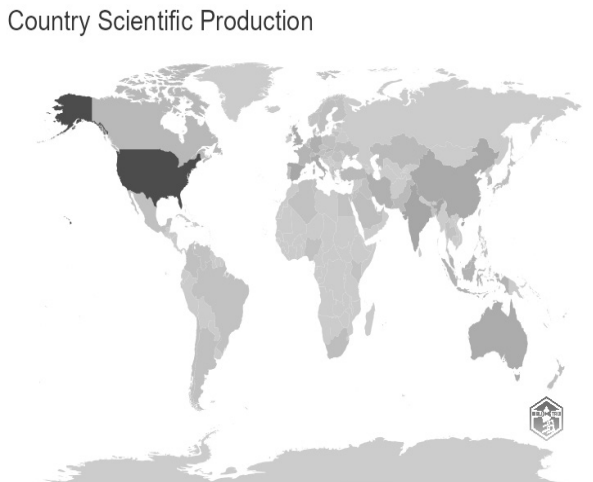

Figure 4. Country-wise scientific publications on social intelligence.

In figure 4, the navy-blue shades show more contributions in published research by the country. However, the shades of sky blue reflect opportunities for developing countries. India, with a medium-toned blue hue, is an opportunity to expand its understanding of social intelligence and capture pieces of evidence of application at the workplace. The US has contributed most of the literature available and research evidence published on Scopus. India has the potential to collaborate more and improve its influence across the globe.

Considering the evolution of researchers' interest in combination with environmental factors, Leadership has been consistent and constant since 2011 as can be seen in figure 5. However, resilience and artificial intelligence with social intelligence have intrigued people to understand interaction better in the business and management domains. Social and emotional intelligence with respect to work readiness was in swing post covid.

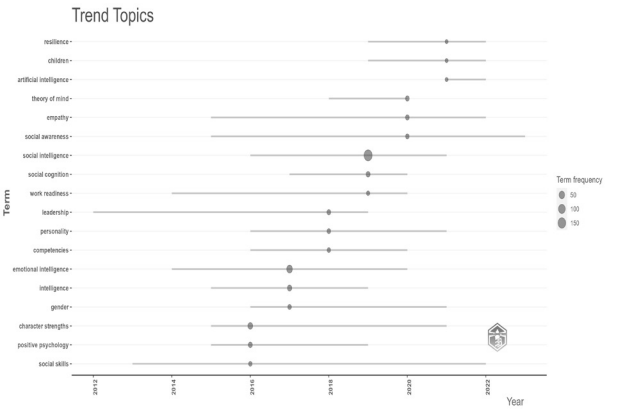

Figure 5. Year-wise term frequency distribution graph.

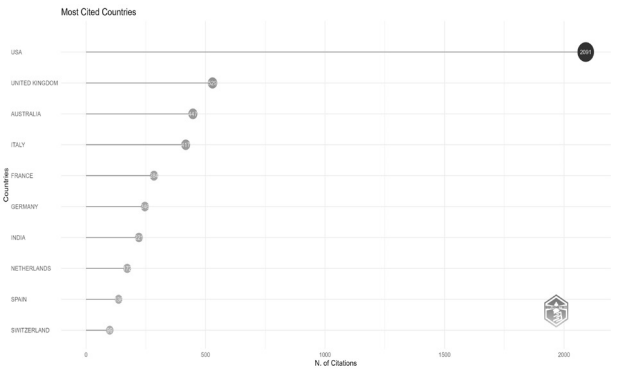

Figure 6. Country-wise citations in the social intelligence domain.

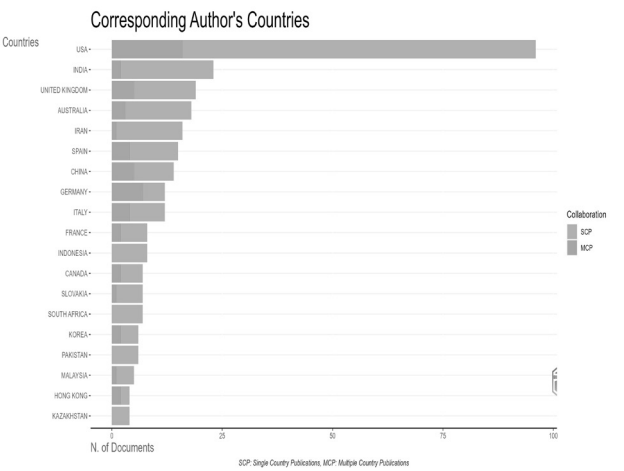

Figure 7. Graph showing cross country collaborations among authors.

Figure 6 shows that India ranks 7th in terms of influence and global citations of research in the domain of social intelligence, with the USA having unbeatable total citations of 2091 followed by United Kingdom.

With a relatively low MCP score (figure 7), SCP of India opens an opportunity to invite cross-nation research collaboration. It allows the researcher to conduct more culturally diverse research with eye-opening, relevant findings. It also allows developing countries to learn from developed countries in the process of knowledge creation.

On performing trend analysis using R Biblioshiny, it was observed that questionnaire, workplace and decision-making have a strong thread attached to social intelligence. (Refer figure 8) However, review techniques to understand the current research assessment and identify future opportunities open an opportunity to define social intelligence in the workplace context. A close link between social cognition and perception has been observed in performing content analysis. ICT and robotics have a widespread web presence, making them a concept of interest for multidisciplinary research.

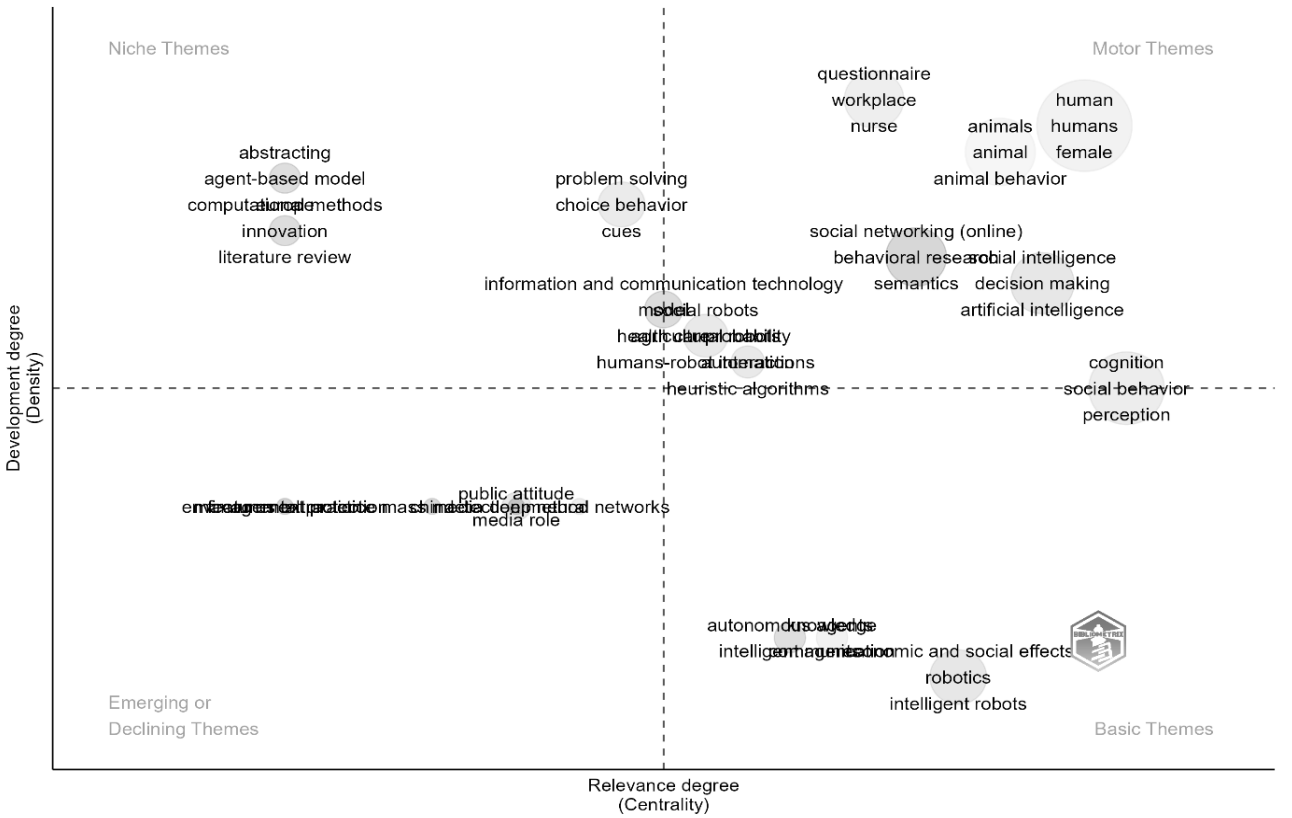

Figure8. Showing trend analysis of recurring themes.

Discussion

The discussion appears as a critical juncture for synthesizing key findings, and fostering a deeper understanding of how these insights resonate across diverse domains of social intelligence. The year wise trends suggest a rapid growth in the publication rates from 2020. This could be a result of the global social disconnect due to Covid-19 precautionary lockdowns and realization of need to socialize. This could also be a consequence of loss of social skills during the phase. Further, "Personality and Individual Differences" has been the top publisher among the screened journals with a whopping 25% share among all the published documents. The journal has published works in conjunction with variables like gullibility, dysfunctional trusting, dark triad, social anxiety, emotional intelligence, social perception, psychopathy traits, relational aggression, academic intelligence, interpersonal competence and general ability.

The bibliometric analysis shows that the United States has been the leading country in terms of producing academic endeavours in the field of social intelligence. It also aimed at producing works that are application oriented, with a particular focus on workplace. India on the other hand, shows collaborative potential to establish its influence globally. This is particularly true, in the light of the country's cultural and religious heterogeneity, which offers a complex and more nuanced society to practice and study social intelligence.

Leadership and social skills have been in swing for a long time, however artificial intelligence, emotional intelligence, empathy and resilience can be seen as important collaborative themes post covid. With the advancement in artificial intelligence, an opportunity to understand the emerging technology interaction can be studied at the workplace in future.

The United State and the United Kingdom occupy the first and the second rank in terms of number of citations. India stands at 7th position on the same chart. In terms of cross-country collaborations, India has a lower Multiple Country Publication which leaves it open for collaboration

opportunities. This paves the way for a better integration of cross-cultural research work, addressing heterogeneity and global diversity in terms of social intelligence. It was also noted that ICT, robotics and intelligent robots have a significant presence on the web making the construct of social intelligence open to interdisciplinary research.

Conclusion

This review paper discloses an increasing trend in publication over the years in ABDC listed journals. This points at the increasing attention garnered by social intelligence, particularly by journals like "Personality and Individual Differences, "Journal of business research", "International journal of selection and assessment" to name a few. Moreover, the review also charts the positive relationship of social intelligence on project management, turnover intentions, executive performance and other variables.

Implication

Organizations can benefit from incorporating social intelligence as an important HR variable to lubricate the interpersonal dynamics, communication, leadership, workplace collaboration, empathy and positive organizational culture. The insights uncovered also form basis for therapeutic interventions aimed at improving the social intelligence of individuals, particularly those facing difficulty in social interactions. Given the globally connected 21st century world, it becomes important to stress on social intelligence to have a holistic cross-cultural competence. Policy makers could benefit from social intelligence by giving it space in policies aimed at improving community engagement, inclusivity and strengthening the fabric of society.

Limitation And Future Direction

The analysis is limited to a temporal space of over a decade (13 years) between 2011 and 2022. A temporally broader study could aid into uncovering a more comprehensive and holistic overview of the social intelligence landscape. The analysis is also limited to ABDC listed journals which restricts the academic probe from looking into other journals of importance. The heterogeneity of the selected works for analysis inadvertently influences the comparability. Since there is a language bias resulted from using "English" as a selection criterion, omission of important literature is highly likely in the analysis.

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Sustainable Tourism and Sustainable Development: A Thematic Analysis

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Abstract

This research paper investigates the intricate interplay between sustainable tourism and sustainable development, two concepts deeply intertwined in contemporary discourse on responsible travel practices and holistic development frameworks. Through a comprehensive analysis employing the SPAR-4-SLR methodology, the study sheds light on key trends, influential authors, prominent journals, and prevalent keywords within the realm of sustainable tourism and sustainable development. The Journal of Sustainable Tourism emerges as a pivotal platform for scholarly discourse, alongside Tourism Management and Current Issues in Tourism. Furthermore, keywords such as ecotourism, tourism development, and sustainability underscore the thematic focus of research, highlighting the imperative of environmental conservation, socio-economic development, and cultural preservation within tourism contexts. This research provides valuable insights for scholars, practitioners, and policymakers seeking to advance sustainable tourism practices and contribute to the broader agenda of sustainable development.

Keywords: *Sustainable tourism, sustainable development, ecotourism, tourism development, SPAR-4-SLR*

1, Introduction

Tourism is a multifaceted phenomenon encompassing social, cultural, and economic aspects. It involves relocating individuals to foreign countries or destinations beyond their habitual surroundings, driven by personal or business/professional motives. (UNWTO)

defines sustainable tourism development as satisfying the current demands of tourists and host regions while safeguarding and improving prospects. The Brundtland Commission provided the original definition of sustainable development in Our Common Future as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'(World Commission on Environment and Development 1987: Craik, J. (2023). Signposts For Sustainability: New Competencies for Occupational Therapists in Canada. Occupational Therapy Now, 26(1), 23-25. 43).

Alternative development approaches, too, have an environmental concern – the driving force behind sustainability – that has evolved from the narrow conservation ideology of the 19th century into the broader environmental movement of the late 20th century. Since the 1960s, environmentalism has embraced resource problems and the technological, economic, social, and political processes underpinning such issues. Sustainable development promotes a comprehensive approach, recognizing that development can only be sustainable when evaluated within a global political, social, and ecological framework. Upon initial observation, the fundamental idea of sustainable tourist development encompasses comprehensive planning.(Sharpley, 2000)

Need for sustainable tourism. The negative consequences of conventional tourism have made sustainable tourism a widely discussed subject. The notion aims to achieve equilibrium between economic, social, and environmental goals, but it is intricate and has multiple aspects. There are several benefits to consider, including the conservation of the environment and cultural history and the economic rewards for local communities. Sustainable tourism

has significant problems, including the complexities of defining and quantifying it, its higher cost than conventional tourism, and the potential adverse effects on local people. An important obstacle is the need for incentives for industry participants, rendering it difficult for stakeholders to adopt sustainable tourism approaches and practices(Fuchs et al., 2023). Given that climate change has evolved into a critical worldwide environmental disaster and considering the ongoing rise in emissions from tourism, it is reasonable to anticipate that sustainable tourism research would prioritize addressing this issue.(Peeters et al., 2024)

RQ1.The objective is to analyze the correlation between sustainable tourism and sustainable development by clarifying fundamental concepts, identifying obstacles, and highlighting potential prospects.

RQ2.The objective is to determine the authors with the most citations, the journals with the most influence, and the most commonly used keywords on sustainable tourism and sustainable development.

RQ3.This aims to offer valuable information to researchers, professionals, and decision-makers interested in promoting sustainable tourism and positively impacting sustainable development as a whole.

RQ4. What thematic areas characterize sustainable development research?

2. Methodology

This study comprehensively analyzes sustainable tourism by utilizing many research methods, including bibliometric content analysis. This approach is by the suggestion made by(Lim et al., 2022)no review, to date, has provided a comprehensive overview of the past, present, and future trends of CE. Instead, past reviews on CE are often limited to conceptual (e.g., construct(Joshi et al., 2023)this study undertakes a systematic literature review using a bibliometric-content analysis to map the extant literature where consumer behavior, social media, and influencer marketing are intertwined. Using 214 articles published in journals indexed by the Australian Business Deans Council (ABDC. and is consistent with recent systematic literature reviews. The processes of assembling, arranging, and assessing specified in the procedure developed by(Paul et al., 2021), the Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR), is utilized and elucidated in the following sections to conduct a systematic literature review.

2.1. Assembling

The assembly phase comprises the tasks of "Identification" and "Acquiring" articles for review. The "Identification" task entails determining the "review domain," "research questions," "source types," and "source quality." The scope of the review domain is centered around the concepts of "sustainable development" and "sustainable tourism within the field of "Business, Management, and Accounting." Because of their direct significance. The study employs the Scopus database as the search technique. The search encompassed the period from 1991 to 2024, with 1991 being selected as the starting point due to its significance as the year when the notion of sustainable tourism was first proposed. Selecting 1991 as the initial year guarantees a meticulous and relevant examination of the available literature on sustainable tourism. The date of April 5 was chosen as the endpoint since it corresponds to the most recent complete year at the time of the search, which is in line with the recommended strategy by(Lim et al., 2022)no review, to date, has provided a comprehensive overview of the past, present, and future trends of CE. Instead, past reviews on CE are often limited to conceptual (e.g., construct. The search keywords, such as "sustainable tourism," "sustainable development," "sustainable tourism development," and "ecotourism," were generated through brainstorming and were confirmed by specialists in marketing and review study methodologies. A grand total of 1789 items were acquired during the search procedure.

2.2. Arranging

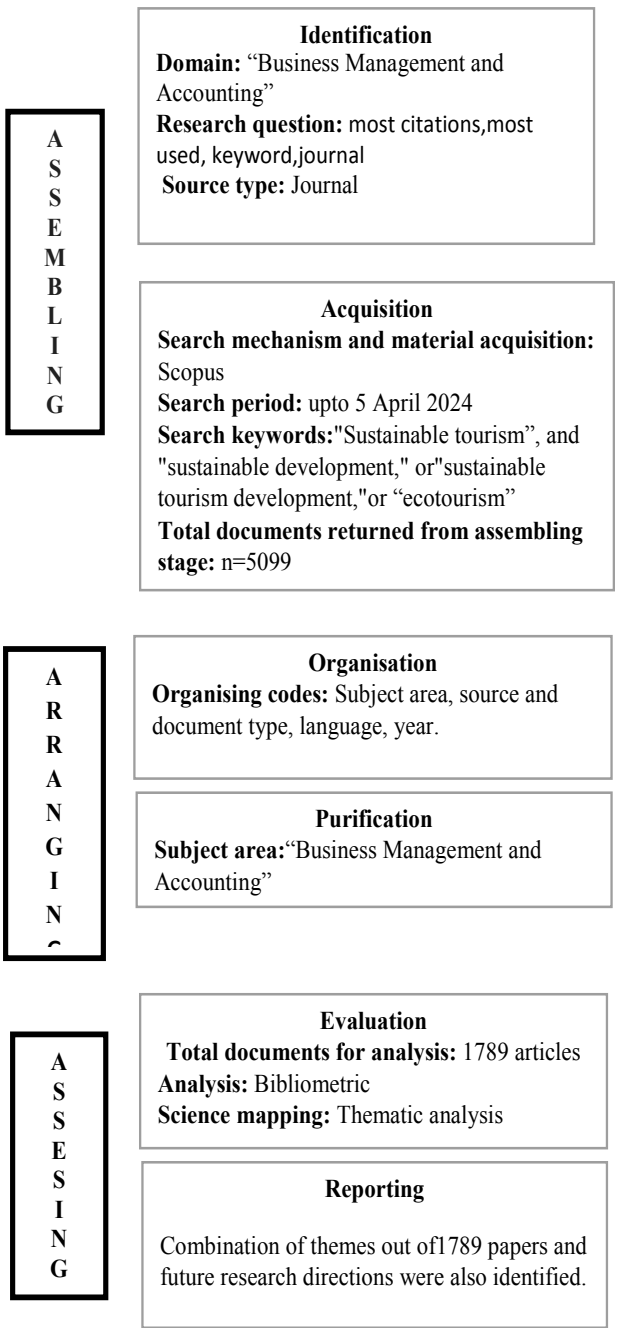
Arrangement entails the methodical organization and refinement of content by applying criteria for both exclusion and inclusion to the items that have been obtained. The codification pertains to every research question, encompassing aspects such as the "journal title." At this step, the process of extracting and organizing bibliometric details happens at the same time. During the purification step, we methodically incorporate article 2344 on business management and accounting from article 1815 and from journal 1806 ongoing evaluation. Subsequently, we utilize this corpus for bibliometric studies. Subsequently, we select exclusively publications published in English for the purpose of conducting a rigorous quality assessment in the year 1789. Out of these options.

2.3. Assessing

Assessment entails the examination and analysis of reviewed papers, focusing on two primary components: bibliometric analysis and content analysis. To accomplish two aims, we utilized the "Bibliometrix package" of the "R studio" software for bibliometric analysis, as outlined by(Aria & Cuccurullo, 2017)fragmented, and controversial research streams. Science mapping is complex and unwieldly because it is multi-step and frequently requires numerous and diverse software tools, which are not all necessarily freeware. Although automated workflows that integrate these software tools into an organized data flow are emerging, in this paper we propose a unique open-source tool, designed by the authors, called bibliometrix, for performing comprehensive science mapping analysis. bibliometrix supports a recommended workflow to perform bibliometric analyses. As it is programmed in R,

the proposed tool is flexible and can be rapidly upgraded and integrated with other statistical R-packages. It is therefore useful in a constantly changing science such as bibliometrics. Aria & Cuccurullo, 2017.

Figure 1. SPAR-4-SLR Guidelines



3.Results

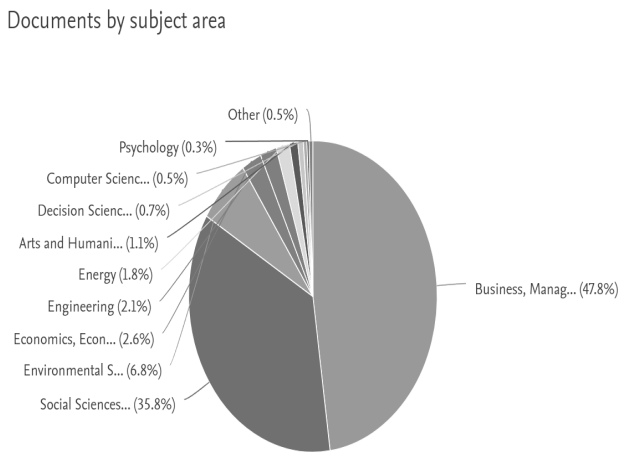
3.1. Subject area distribution

The pie chart may show academic or research content across fields. Below is an analysis of the potential meaning behind each percentage and field. The field of "Business and Management" comprises 47.8% of the total. This category represents the largest portion, indicating that almost half of the content or research covered is related to business and management. Possible subjects could encompass" business strategies", "management methodologies", "organizational dynamics", and "corporate governance". The field of study known as social sciences comprises 35.8% of the total. This substantial segment pertains to research or content in the realm of "social sciences", including disciplines such as "sociology", "political science", "anthropology", and other related fields. It emphasizes the significance and magnitude of effort required to comprehend societal structures and human behavior. The field of "Environmental Sciences" comprises 6.8% of the total. Research about environmental concerns, encompassing topics such as "climate change", "preservation", and "sustainable methodologies". This field centers on the interplay between humans and the environment, as well as the repercussions of human actions on natural systems. The fields of economics, econometrics, and finance account for 2.6% of the overall subject matter. This subfield focuses on the examination of economics, econometric models, financial markets, and economic policies. The research encompasses economic theories, market analysis, and financial management. Engineering comprises 2.1% of the total. Presenting research in diverse fields of engineering, including civil, mechanical, electrical, and chemical engineering. This field pertains to the utilization of scientific and mathematical principles for practical purposes.The percentage of energy is 1.8%. Content centered around the generation, transmission, and utilization of energy. Possible subjects could encompass sustainable energy sources, energy optimization, and energy governance. The Arts and Humanities field comprises 1.1% of the total. Conduct research in fields such as literature, history, philosophy, and the arts. This category delves into the realms of human culture, artistic expression, and the intellectual journey of humanity. Decision Sciences (0.7%) this discipline utilizes analytical techniques to assist in decision-making processes, typically covering domains such as operations research, statistics, and strategic planning. Computer Science (0.5%) a modest proportion of research in computer science encompasses software development, artificial intelligence, cybersecurity, and computational theory. Subject matter includes 0.3% psychology this concise segment pertains to examining the mental processes and actions of individuals, encompassing fields such as cognitive psychology, clinical psychology, and developmental psychology. The rest (0.5%) category contains any research or content that does not cleanly fall into the aforementioned disciplines. It has the ability to contain multidisciplinary studies or emerging topics that have not yet been broadly labelled.

The graphic reveals that a substantial part of the study or content is mostly focused on Business, Management, and Social Sciences, which collectively account for more than

80% of the total. Environmental sciences, economics, and engineering are less popular. Energy, Arts and Humanities, Decision Sciences, Computer Science, and Psychology make up a small portion of the content. This distribution offers useful information about the key areas of focus and the comparative size of research across different academic fields.

Figure 2: Subject area distribution



3.2. Geographic Distribution

The "United Kingdom and the United States" have the highest counts, signifying their dominant position in the depicted measure. "Australia, China, Spain, South Africa, and Canada" make a moderate contribution, demonstrating a substantial but lesser level of activity or count compared to the "UK and US ,New Zealand, Italy, and Sweden" have fewer counts in comparison to other countries, indicating reduced levels of involvement or activity in the monitored area.

Figure 3: **Geographic Distribution U**

3.3. Most Cited Authors:

The investigation uncovered several significant conclusions including the authors who have been cited the most, the journals that have been deemed the most significant, and the keywords that are most commonly used in research relevant to sustainable tourism and sustainable development. The writers "Bolly BB",

"Hall CM", and "Weaver DB" appeared as important contributors on the list of the most cited authors. Their respective scholarly works were ascribed to a total of twenty-nine, nineteen, and eighteen articles, respectively. The discourse on sustainable tourism and sustainable development has been substantially impacted by their research, which has resulted in the formation of theoretical frameworks, empirical investigations, and policy suggestions within the sector.

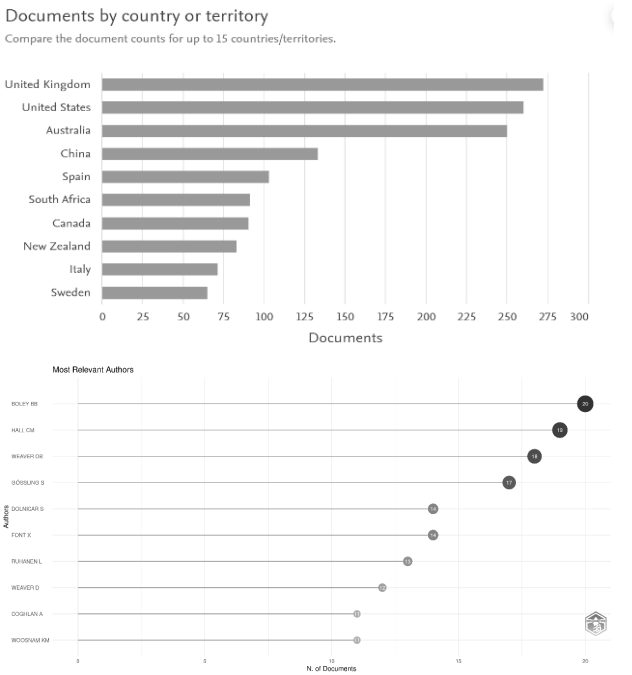


Figure 4: Most Cited Authors

3.4. Most Cited Journals:

In terms of prominent publications, the Journal of Sustainable Tourism emerged as the publication that received the most citations. It featured 515 papers that featured contributions connected to sustainable tourism and sustainable development. The journals Tourism Management and Current Issues in Tourism have also developed as key platforms for scholarly discourse. A total of 95 and 64 papers, respectively, have been published that showcase research on these topics. The purpose of these periodicals is to serve as important knowledge repositories, offering insights into developing trends, best practices, and crucial debates that are occurring within the field of sustainable tourism and sustainable development.

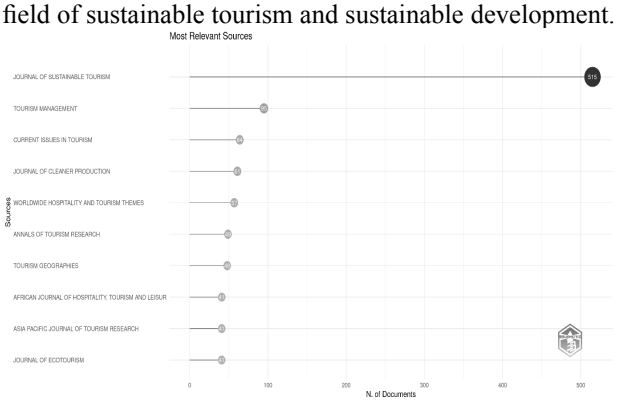


Figure 5: Most Cited Journals

3.5. Most Used Keywords:

In addition, the study uncovered several prominent terms that highlight the thematic focus of research in this particular subject. When it comes to addressing "environmental

conservation, socio-economic development, and cultural preservation" within "tourism contexts, ecotourism, tourism development, and sustainability" emerged as the most often used keywords. This reflects the underlying concerns of scholars and practitioners in this area. To achieve sustainability in tourist practices and policies, these phrases capture the diverse character of sustainable tourism and sustainable development. They include environmental stewardship, community participation, and economic viability as basic imperatives for achieving sustainability.

Figure 6: Most Used Keywords

3.6. Thematic analysis

The co-citation study of PageRank in sustainable tourism research identified two primary themes. Higher PageRank ratings indicate greater citation by reputable articles. Greater "betweenness" and "closeness centrality" scores show the significance of an item in terms of its relevance to different themes and its importance within each theme, respectively(Donthu et al., 2021).

3.6.1 "Community Empowerment and Sustainable Tourism: Integrating Environmental and Social Perspectives" The concept of community empowerment involves emphasizing the concepts of participation, empowerment, and activities relating to the community (J. Beall & Boley, 2022; J. M. Beall et al., 2021; Boley, Ayscue, et al., 2017; Boley, McGehee, et al., 2017; Strzelecka, Boley, & Strzelecka, 2017; Strzelecka, Boley, & Woosnam, 2017)none have explicitly incorporated the three tenets of ecotourism (i.e. nature, education, and sustainability The concept of sustainable tourism is centered on the promotion of activities that are friendly to the environment, the cultivation of positive attitudes toward tourism, and the comprehension of the implications that tourism has on both the natural environment and the communities that are located in the area(Dolnicar et al., 2019; Dolnicar & Long, Juvan & Dolnicar, 2017;) o.2017.08.087","ISSN":"09596526","abstract":"Tourists must behave in a more environmentally friendly way to reduce the negative environmental impact of the global tourism industry. Only a few approaches have been developed to promote this. This may be because it is generally assumed that all kinds of environmentally sustainable behaviour have the same drivers. This study challenges this assumption. Results of this research indicate that specific environmentally sustainable tourist behaviours have distinctly different drivers. Consequently, interventions designed to make tourists behave in a more environmentally friendly way need to be specific to the behaviour targeted for modification. Alternatively, choice architectures can be altered in an attempt to change behaviours without having to modify people's values This study investigates why people who actively engage in environmental protection at home engage in vacation behaviour which has negative environmental consequences, albeit unintentionally. The environmental activists participating in the study were highly aware of the negative environmental consequences of tourism in general, but all displayed an attitude-behaviour gap which made them feel uncomfortable. Participants did not report changing their behaviour; instead, they offered a wide range of explanations justifying their tourist activities. Gaining insight into these explanations contributes to our understanding of why it is so difficult to motivate people to minimize the negative environmental impacts of their vacations, and represents a promising starting point for new interventions to reduce environmentally unsustainable tourism behaviours. © 2014 Elsevier Ltd.",This paper tackles a key issue arising from the United Nations World Tourism Organization call for consumers to take climate change into consideration when making travel decisions. Some people genuinely want to comply with this request. However, they face the \"perplexity of environmental information\", a series of informational barriers to decision-making. Can they assess their travel's climate change impacts easily? Studies were conducted with 261 potential travellers in Australia and Slovenia. Results from an empirical study on using carbon footprint calculators suggest that they cannot: tourists are unfamiliar with carbon calculators and, if alerted to their existence, find them difficult to use and have doubts about their credibility. They are also not good at estimating, without assistance from a carbon calculator, the amount of greenhouse gas emissions caused by different components of their vacation. Tourism industry and public policy makers interested in environmentally sustainable tourism need to develop improved ways of providing tourists with trustworthy and user-friendly information about the carbon footprint implications of their vacation decisions. In so doing they can empower tourists who want to consider environmental issues when planning their vacation to actually do so. © 2013 Taylor & Francis." This paper answers key questions about personal and industry decision-making in implementing sustainable tourism. Being environmentally friendly is typically associated with sacrifice, including sacrifice of comfort (e.g. walking rather than driving. The concept of social and environmental integration refers to the process of bringing together aspects such as gender equality, the inhabitants' passion for the natural world, and the specific traits of areas that are targeted by geotourism(Aleshinloye et al., 2021; Denley et al., 2020; Joo et al., 2020; Megeirhi et al., 2020)one cannot travel. This is impossible. This

paradox is particularly evident within last chance tourism (LCT.

3.6.2. "Driving Sustainable Tourism: Integrating Policy, Technology, and Community Empowerment for Urban and Global Impact"

The notion of sustainable tourism refers to tourism that places an emphasis on the adoption of sustainable practices, the application of ecotourism concepts, and the cultivation of sustainable hospitality. Integration of Policy: Emphasizing the role of public policy in the advancement of sustainable tourism and tourism(de Lange & Dodds, 2017; Dodds et al., 2018)CBT can become a poverty alleviation mechanism and a way to access improvements in quality of life, providing empowerment and greater economic benefit to individuals in local communities. Despite the plethora of literature on CBT and evaluation of models, there is little analysis of the facilitators and barriers to achieving it. Through the use of case studies in both academic and grey literature, this paper serves as an instructive review of the CBT literature to synthesize the key elements of success and the challenges.","Purpose: The purpose of this paper is to explore the link between social entrepreneurship and sustainable tourism and to examine the Canadian context in this regard. Design/ methodology/approach: The methodology entails a case study approach that includes a thorough review of the related literature and of any existing Canadian sources of hospitality and tourism social entrepreneurship/ intrapreneurship projects to determine the state of the Canadian industry with respect to sustainability. Findings: Findings show that there are limited showcased hospitality and tourism social entrepreneurship projects in Canada. Two main assumptions related to the Canadian context can be drawn from this search: (1. Examining the application of information and communication technology (ICT) to efficiently manage sustainable tourism is the focus of this technology.(Dodds et al., 2018). Several different components are included in the concept of community empowerment. These include the provision of economic benefits to local communities and the promotion of social entrepreneurship.(Brendehaug et al., 2017; Koens et al., 2022)reflecting a diverse array of tourism stakeholders. By observing in-game experiences, a pre- and post -game survey and short interviews six months after playing the game, the process and impact of the game was investigated. While it proved difficult to evaluate the value of a serious game approach, results demonstrate that enacting real-life policymaking in a serious game setting can enable stakeholders to come together, and become more aware of the issues and complexities involved with urban tourism planning. This suggests a serious game can be used to stimulate the uptake of academic insights in a playful manner. However, it should be remembered that a game is a tool and does not, in itself, lead to inclusive participatory policymaking and more sustainable urban tourism planning. Consequently, care needs to be taken to ensure inclusiveness and prevent marginalization or disempowerment both within game-design and the political formation of a wider participatory planning approach.","Both in a national and global context, it is challenging to identify key conditions for the integration of sustainable tourism in public policy. By studying a number of recent planning processes pertaining to tourism development, this article aims to contribute recent insight into how sustainability may be integrated into tourism planning. The study was motivated by a publicized shift in the Norwegian government policy strategy on sustainable tourism, from a sector approach to an integration approach. Through case analysis, the concept of environmental policy integration is applied. Findings show that sustainable tourism is partially integrated in all cases and three key issues are outlined. First, although Norway is characterized by a high degree of sector organization, it has a weak structure for overall tourism policy integration. Second, the integration of sustainable tourism has been stimulated by national horizontal integration, bottom-up integration prepared by institutional changes, public participation, and by active use of the municipal system of planning. Third, this study could not find any evidence for the announced shift from a sector approach to an integrated approach to sustainable tourism.","Many studies have explored how the tourism sector and tourism policies understand and relate to the concept of sustainable development. A common conclusion is that tourism concentrates on economic and social viability at the expense of environmental sustainable development. This paper considers if and how the concept of environmental policy integration (EPI. The primary objective of this urban spotlight is to encourage introspection regarding the sustainable practices specific to urban settings, as well as the challenges brought about by climate change issues.(Koens et al., 2021; Melissen & Koens, 2016)which could serve as the foundation for a destination-design-driven approach to urban tourism governance and dealing with overtourism issues. This conceptual framework is purposely designed to stimulate collaborative (informed.

3.6.3."Innovative Quality Control and Policy Strategies for Sustainable Tourism: Balancing Mass Tourism and Ecotourism for Global Impact"

A focus on the instruments and tactics that are utilized to maintain and improve the quality of sustainable tourism is what we mean when we talk about quality control. In order to achieve sustainability and resilience, it is essential to emphasize the importance of innovative tactics and creative improvements.(Lesar et al., 2020; D. Weaver et al., 2020; D. B. Weaver et al., 2022)as per evolving citizenship theory, include conferrals of duties and rights that synthesize the two approaches and designate appropriate virtues and behaviors across norms

of participation, autonomy, commitment to social order, and solidarity. Citizenship, additionally, is an existing status which bestows member equality, and has evolved to include an engagement-based dimension effective for addressing specific topics such as tourism sustainability. We integrate citizenship rights, duties, virtues and behaviors into the enlightened mass tourism framework to create a compelling basis for attaining sustainable and resilient tourism which complements ongoing dominant narratives of "resident" or "community." Future studies should consider issues associated with problematic or qualified citizenship, the status of tourists, and incorporating resilience.",:"Sustainable tourism quality control tools (ST-QCTs. Strategies and ideas for resolving the challenges of mass tourism management are discussed in this article. Sustainably managing mass tourism. This article will investigate the benefits and motivating factors behind promoting ecotourism and Indigenous tourism. (Bramwell, 2010, 2015; Bramwell & Lane, 2000, 2002, 2010; Mellon & Bramwell, 2016). Policy and Planning: This entails the implementation of policies that promote sustainable tourism, strategic planning, and management practices that are effective to guarantee the industry's continued viability over the long term. Exploring tourist incentives, commitment, and various perspectives on the expansion of tourism is what we mean when we talk about tourist engagement.(Lane & Kastenholz, 2015).

3.6.4. "Visitor Management and Development Strategies for Sustainable Tourism: Integrating Public Motivation, Rural Aesthetics, and Sustainable Practices"

Visitor management is concentrating on the tools and strategies that can successfully govern and encourage the behavior and participation of visitors. The goal of this study is to investigate the factors that drive individuals to select environmentally responsible destinations(Tan & Law, 2016; Wang & Man, 2019) there is a need for implementation of effective visitor management strategies at these sites to mitigate visitor impacts. This study explores the application of mobile learning (mLearning. In order to promote sustainable tourism, it is essential to emphasize the significance of rural tourism and its aesthetic value. The concept of sustainable development incorporates not only the particular issue of sustainable tourism development but also the more general objectives of sustainably developed communities, Examining the impact of tourism on socioeconomic mobility and societal development. We are examining the impact of tourist behavior on the development of destinations. Instruments for measuring: Referring to the utilization of scales such as the Sustainable Tourism Attitude Scale (SUS-TAS) to evaluate attitudes toward sustainable tourism(Guo et al., 2018; Zhang et al., 2020)using structural equation modelling, with data from 297 Taiwanese night market entrepreneurs. Significant theoretical contributions to understanding relationships between entrepreneurs and community were found: effects of community satisfaction on support for tourism were significant and fully mediated by perceived benefits. Community factors and tourist contact frequency were important in entrepreneurs' decisions on further tourism development. Community factors showed low but significant relationships with the perceived costs of tourism, A case is made for sustainable tourism governance measures, including partnership creation, destination management systems, and visitor experience planning.",,"A thorough understanding of the influencing factors and mechanisms of community resilience in tourism destinations is vital not only for recovery after disasters but also for strengthening the adaptive capacity of community residents to manage sudden change. This study aims to investigate the roles of bonding, bridging, and linking social capital in enhancing community residents' perceived resilience in tourism destinations. Based on data derived from a survey of 691 residents of China's Dujiangyan scenic areas and Jiuzhai Valley National Park, this study used structural equation modeling to test the relationship between community residents' perceived social capital and resilience in tourism destinations. The findings suggest that the three types of social capital have significantly positive effects on community residents' perceived resilience in tourism destinations. In China's centralized political system, linking social capital is the most important type of social capital in community disaster recovery. An interaction effect between bonding, bridging, and linking social capital is found. This study's results help managers and community residents cultivate social capital, improve community resilience and maintain sustainable tourism development."

3.6.5."Stakeholder Engagement and Community Support in Sustainable Ecotourism and Tourism Development"

The focus of this article is to highlight the significance of ecotourism in achieving sustainable tourism. Management of Stakeholders: Emphasizing the significance of adequately managing and engaging critical stakeholders, particularly those associated with World Heritage Sites (WHS). Examining the assistance and involvement of residents and indigenous people in the process of planning and advancing tourism programs is what is meant by the term "community participation." (Jaafar et al., 2016; Rasoolimanesh et al., 2017; Rasoolimanesh & Jaafar, 2017)this paper uses stakeholder theory to explore the heterogeneity of positive and negative perceptions among residents and their effects on residents' support for and participation in sustainable tourism development. Data from 221 completed questionnaire surveys revealed heterogeneous negative perceptions across residents'

age, level of education and economic involvement in tourism. Moreover, residents' positive perceptions had a positive effect on their support for and participation in tourism development. This study contributes to the resident perception literature by using stakeholder theory to conceptualise the heterogeneity of residents' perceptions and by examining the effects of those perceptions on their support for and participation in tourism development in a rural WHS destination in the developing world. Furthermore, the findings of this study have practical implications for local authorities aiming to improve residents' support and participation in tourism planning for sustaining tourism development.",:"This paper investigates three issues concerning younger residents of the Lenggong Valley World Heritage Site (WHS. Addressing the perceptions of young residents in connection to the growth of tourism and the conservation activities undertaken is an essential aspect of youth perception and conservation. When we talk about "sustainable tourism indicators" (STIs), we are referring to the utilization of indicators to measure sustainable tourism growth. This includes taking into account the opinions of stakeholders. (Darvishmotevali et al., 2024; Latip et al., 2018; Rasoolimanesh et al., 2017, 2019; Rasoolimanesh & Jaafar, 2017)Iran. Findings: The findings reveal that the locals' community support is affected by their level of environmental awareness, opportunity and attitudes toward SSTD. However, the results do not reveal an influence of environmental knowledge and community attachment on SSTD. The findings enrich the existing literature on community attitude predictors by showing that locals' SSTD level is not consistently based on common predictors. Such support strongly depends on host communities' attitudes toward supporting tourism, which is definitely not the same among residents. It is imperative to know whether people's attitudes arise from a desire to protect the area or for reasons of self-interest. Originality/value: The findings provide further support for the tenets of the segmentation approach and challenge existing knowledge on host communities' attitudes about factors influencing residents toward SSTD. The findings have several practical implications regarding community participation for regional and national authorities and destination policymakers.","This study investigates whether the perceptions and attitudes of residents living within the vicinity of heritage tourism sites differ from those living further afield. It examines residents' attitudes toward tourism development; community attachment; environment and culture attitudes; economic gain; and involvement, alongside the moderating role of distance from heritage tourism sites. In doing so, it investigates how the aforementioned factors influence residents' perceptions of tourism development in their city. Data was collected from inhabitants of Kashan and Tabriz, two historic cities couched within Iran's growing heritage tourism sector, and analyzed using partial least squares - structural equation modeling. The findings demonstrate significant differences between the perceptions of tourism impacts, economic gain, environmental and cultural attitudes, and involvement between residents living within the vicinity of heritage tourism sites and those living further afield. However, these findings contradicted the hypotheses; identifying higher positive perceptions, environmental and cultural attitudes, economic gain, and involvement for residents living far from heritage tourism sites. Further, the findings did not support the moderating role of distance for the effects of influencing factors on residents' perceptions. Therefore, this study proffers significant theoretical contributions and practical implications with regards to developing sustainable tourism in Iran.","Purpose: This paper aims to investigate the perceptions of indigenous people towards tourism development and the factors that influence their perceptions of the economic, social and environmental impacts of tourism. Design/methodology/approach: This study will focus on the perceptions of an aboriginal group indigenous to Malaysia, and draws upon a sample of 272 from the Lower Kinabatangan region of Sabah, Malaysia. Respondents were administered a questionnaire, the results of which were analysed by way of partial least squares–structural equation modelling. Findings: The results indicate a significant positive effect for economic gain on the perceived economic and environmental impacts of tourism, and of community involvement on the perception of social impacts. Moreover, the study found that the perception of environmental impacts, followed by perceived economic impacts, had a strong effect on support for tourism development. Originality/value: This study makes a significant theoretical contribution to the resident perception literature by investigating how the perception of tourism impacts affects indigenous residents' support for tourism development. Furthermore, this study describes a number of practical implications of this study for the promotion of sustainable tourism development among indigenous residents.","Set in Malaysia's Lenggong Valley World Heritage Site (WHS

4. Discussion and future research direction

This study offers valuable insights into sustainable tourism and its correlation with sustainable development. The text emphasizes the significant contributions of well-known writers, influential journals, and common keywords, highlighting the necessity of a comprehensive approach to tourism growth. This strategy places a high importance on the conservation of the environment, the preservation of socio-cultural traditions, and the encouragement of economic progress. Sustainable tourism is depicted as a driving force for beneficial transformation, promoting the ability to recover and maintain sustainability in communities worldwide. Essential elements include empowering the community,

conservingtheenvironment,andpromotingsocio-economic growth. Prioritizing sustainable methods and cultivating a positive mindset towards environmental preservation effectively reduce ecological impacts and improve tourist contentment information and communication technology (ICT) aids in effectively administrating and supervising sustainable tourism activities. Effective policy integration is essential for tackling the difficulties posed by mass tourism and supporting sustainable practices throughout the business. Stakeholder involvement and community backing are crucial for attaining sustainable ecotourism. Tools such as Sustainable Tourism Indicators (STIs) and the Sustainable Tourism Attitude Scale (SUS-TAS) are essential for evaluating and directing the progress of sustainable tourism. Potential areas for future research encompass Investigating community empowerment in various cultural and geographical settings, incorporating cutting-edge technologies into the development of sustainable tourism, analyzing efficient policy frameworks and governance mechanisms, and examining the contribution of ecotourism to the ability of an ecosystem to withstand and recover from the impacts of climate change and creating robust and flexible systems for addressing sustainable tourism indicator (STIs) and examining the dynamics of stakeholder collaboration and analyzing the behaviour and level of involvement of tourists in sustainable tourism and performing comparative research on sustainable tourism in urban and rural areas. By examining and understanding these intricate interconnections, researchers and practitioners can actively contribute to developing more robust and environmentally sustainable tourism destinations globally.

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Analysis of Muslim Tourists' Intentions to Travel to Non-Muslim Countries: A Comparative Study between the Philippines and South Korea

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Abstract

Halal tourism is growing rapidly, not only in Muslim-majority countries but also in non-Muslim countries. The Philippines, a country with a majority Catholic population, has been named an "Emerging Muslim-Friendly Destination" twice in a row since 2023, while South Korea, a country with no Muslim population, was ranked fourth as an "Emerging Muslim Women-Friendly Destination" in 2024. This research aims to explore Muslim tourists' intentions to travel to two non-Muslim countries: the Philippines and South Korea. Content analysis will be used to examine the written responses of Muslim respondents from various countries who have or have not visited South Korea and the Philippines.

Keywords: *Halal Tourism, Muslim Tourists' Intentions to Travel, Non-Muslim Countries, Philippines, South Korea*

Introduction

The halal tourism sector has grown steadily in recent years, fueled by an expanding Muslim population and the promotion of halal-compliant travel experiences. In 2022, the market's revenue was USD 245.78 billion, and it is expected to rise to USD 324.96 billion by 2030 [3].

The rapid expansion of halal tourism in both OIC (Organization of Islamic Cooperation) and non-OIC countries corresponds to the continuous increase in the global Muslim population in recent years, particularly in countries with Muslim majorities and minority. According to the 2015–2023 Global Muslim Travel Index ranking, the most visited non-OIC destinations are Singapore, Taiwan, England, Thailand, and Spain [6].

Based on actual cases from the field, it appears that tourism and hospitality organizations generally lack a thorough understanding of halal principles, limiting their ability to meet the needs of Muslim tourists [4; 8; 11]. The scarcity of halal-friendly services persists in Muslim-majority countries and in many non-Muslim countries. The availability of halal food and worship facilities is the most important attribute that Muslim tourists look for when visiting other countries.

Halal tourism encompasses Muslim-friendly services in all tourist destinations and has nothing to do with specific religious motivations. Muslim-friendly tourism offers essential halal services such as halal food and beverages, as well as a comfortable place for Muslims to perform their daily prayers [1].

Given the rising number of Muslim tourists traveling to non-Muslim countries, some may have more difficulty finding halal food and prayer facilities. Therefore, it is vital to explore the intentions of Muslim tourists to travel to non-Muslim countries. The chosen non-Muslim countries are the Philippines and South Korea.

The Philippines is one of the ASEAN countries that has been recognized twice in a row as an "Emerging Muslim-Friendly Destination" among non-OIC members in the Global Muslim Travel Index in May 2024 [9]. As a country whose majority population is predominantly Catholic, the Philippines' rivals among non-OIC countries in Asia are Singapore, Taiwan, and Thailand.

South Korea is a popular destination for foreign tourists due to its rich cultural heritage, breathtaking natural landscape, vibrant K-pop music scene, and technological innovations from companies such as Samsung and LG. South Korea is 47th in the 2023 GMTI, whereas the Philippines is 36th. However, South Korea is ranked fourth as a "Muslim Women-Friendly Destination" in the Top 10 Non-OIC Destinations 2024 [6].

Even though the Philippines and South Korea are prominent tourist destinations, these two non-Muslim countries need considerable improvements to attract Muslim tourists. For example, South Korea is still regarded as unfriendly to Muslim tourists [4].

Therefore, the aim of this study is to explore Muslim tourists' intentions to visit non-Muslim countries such

as the Philippines and South Korea. The findings of this study may provide insights that will potentially help both countries obtain a deeper understanding of the preferences of Muslim tourists from diverse countries.

Literature Review

The Concept of Halal Tourism

Halal is something that Muslims can consume and practice. If halal was previously associated with food, drinks, and everything consumed by the body, its meaning has now expanded to include almost all existing business fields, beginning with staple foodstuffs, health products and services, cosmetics and personal needs, property, hotels, travel, media, education, financial services, and tourism.

Halal certification ensures that a product is halal. Consumers can rely on this guarantee because it has gone through several stages, requirements, and checks in accordance with regulations. For example, the product is processed properly, is clean, and is not mixed with non-halal ingredients. Product processing must be carried out by people who believe, are pious, and fulfill certain requirements. This certification is required for products derived from or containing animal materials and utilized as apparel, head coverings, accessories, domestic health equipment, household equipment, Muslim worship equipment, and product packaging.

Meanwhile, non-halal products are excluded from the halal certification requirements, for instance, alcoholic beverages and pork-based foods. Other products that do not meet halal criteria include those that have been produced but were made from materials that do not meet the criteria for halal materials or criteria for using new materials, as well as those processed or produced in facilities that do not meet halal criteria and halal production facilities.

Halal tourism refers to Muslim-friendly services in all tourist destinations and has nothing to do with specific religious motivations. Muslim-friendly tourism offers halal services in the most basic form, such as halal food and beverages or separate swimming pools, spas, and gym facilities, as well as offering a comfortable place for Muslims to perform their daily prayers [1].

The availability of halal food is a top priority, as are non-alcoholic beverages, permitted meat, and permitted food preparation techniques. Another important service in halal tourism is the availability of prayer rooms, ablution places, Qibla directions, prayer times, and other Muslim-friendly services. The need for recreation and relaxation with family in accordance with religious teachings is also a significant consideration. The availability of several halal services and products has become a necessity in the areas frequented by Muslim tourists (e.g., airports, hotels, shopping malls, and restaurants).

Growing Interest of Muslim Tourists to Visit Non-Muslim Countries

Halal business prospects are today very appealing in Muslim minority countries such as Japan, South Korea, China, Australia, France, the United States, Europe, and others [7]. As a result, the demand for halal tourism is rising in countries that are not members of the Organization of Islamic Cooperation (OIC).

The most concrete example is that Indonesian Muslim tourists frequently visit non-Muslim countries, such as Thailand [11]. Thailand has been the most popular tourist destination for Indonesian Muslims because it capitalized on the country's halal tourism industry by offering new products that cater to Muslim tourists' needs. They understand that the destination's Halal attributes impact Indonesian tourists' behavior [2].

However, non-OIC countries' competitiveness as halal tourism destinations still has much room for improvement [4]. South Koreans, in particular, have a limited awareness of halal tourism. As a result, Muslim visitors to South Korea continue to encounter non-halal hospitality and tourism products and services. Guidelines in hotels, restaurants, and shopping malls favored by international tourists are essentially nonexistent for Muslim tourists. Inadequate service due to a lack of understanding of Muslim tourists' religious beliefs often occurs. When Muslim tourists visit South Korea, they complain about the food, accommodations, transportation, shopping, and other issues. Overall, South Korea's tourism environment is not halal-friendly enough, and authorities must continue to improve the attributes of these non-Muslim destinations to meet the needs of this valuable market [4].

From these two examples, it is apparent that as halal tourism has grown in popularity, so have the demands and needs of Muslim tourists visiting OIC and non-OIC nations, as well as challenges with food, accommodation, facilities, social environment, and so on. Many non-Muslim countries continue to face significant barriers to halal tourism due to a lack of awareness and understanding of its needs.

The Philippines' Transformation from a Non-Muslim Country to a Favorite Destination for Muslim Tourists

The Philippines, a country with a Catholic majority (78.8%), has emerged as a new Muslim-friendly destination after breaking through to become a magnet for Muslim travelers [9]. The Muslim population comprises only 6.4% [10].

As reported by Arab News on June 5, 2024, the Philippines was recognized as an "Emerging Muslim-Friendly" Non-Organization of Islamic Cooperation Destination at the Mastercard-CrescentRating Global Muslim Travel Index summit in Singapore on May 30, 2024 [9]. This index is an annual report that compares destinations in the Muslim travel market. This means that the Philippines has won the title twice in a row, dating back to 2023.

Since then, the Philippines has boosted its efforts to attract travelers from the Middle East and neighboring Muslim-majority countries such as Indonesia, Malaysia, and Brunei Darussalam [9]. Since January 2024, the Philippines has welcomed over 2 million international tourists, including a 10 percent increase in visitors from Gulf countries such as Saudi Arabia and the United Arab Emirates (UAE).

The country, known for its hospitality, rich cultural heritage, and stunning natural attractions, has taken steps to ensure that Muslim travelers have access to halal products and services. In addition, they adjust accommodations to comply with Islamic rules [9]. They also cater to the needs of Muslim tourists by promoting halal tourism, which boosts their competitiveness in the global tourism market. Overall, the government has responded to Muslim travelers' evolving needs by offering halal-friendly accommodation, dining options, prayer facilities, and other services that not only enhance the overall visitor experience but also respect diverse cultural and religious practices [9].

South Korea as a Muslim Women-Friendly Destination

The market size of Muslim international tourism in South Korea has rapidly increased, particularly the total number of Malaysian and Indonesian travelers [4]. Halal tourism accounted for around 5.3% of the entire inbound tourism market in South Korea in 2016.

Despite the fact that 51% of the population is religiously unaffiliated and none of them are Muslim [12], South Korea ranked fourth in the top ten, demonstrating a thorough understanding of the needs of female Muslim travelers as well as high safety and sustainability standards in general [6]. They have a high sustainability score, indicating a commitment to responsible tourism. South Korea has succeeded in providing a friendly, safe, and respectful environment for female Muslim travelers.

Research Methods

Measurements

To address the research objective, which aims to determine Muslim travelers' intentions to visit the Philippines and South Korea as non-Muslim countries, several open questions will be designed with the ACES 3.0 frameworks used in the Global Muslim Travel Index (GMTI) [6] (see Figure 1) as a reference. This comprehensive framework assesses the Muslim-friendly travel facilities and services in a destination. It has been updated since its introduction in 2017 to reflect the current industry's growth.

This framework evaluates the level of inclusivity and support for Muslim travelers that destinations provide in various aspects of their travel experience. This framework contains four indicators [6]: access, communication, environment, and service (ACES).

Access

Access criteria evaluate the ease of reaching the destination. It analyzes air connectivity, land connectivity, visa requirements, and the quality of transport infrastructure. It enables destinations to identify areas for improvement in order to effectively attract and cater to this market.

Communication

Communication criteria examine a destination's communication capabilities and efforts to market the destination to Muslim travelers. This comprises three key factors: communication proficiency, destination marketing, and stakeholder awareness. These assessments help destinations enhance their communication efforts, improve marketing strategies, and promote understanding among stakeholders.

Figure 1. Aces 3.0 Framework

Source: Mastercard CrescentRating [6]

Environment

Environment criteria assess a destination's overall environment and atmosphere in terms of its appeal and suitability for Muslim travelers. It is comprised of several key factors: general safety, faith restrictions, enabling climate, Muslim visitor arrivals, and sustainability. By taking these factors into account, it offers valuable insights into the overall environment and conditions of a destination as they relate to Muslim travelers.

Services

Service criteria examine the range and quality of services available to Muslim travelers in a destination. It focuses on several critical criteria, including the availability of prayer places and mosques; the availability of halal dining options; Muslim-friendly accommodation; Muslim-friendly airports; and heritage experiences and attractions. By examining these factors, the destination ensures that it provides suitable accommodations, prayer facilities, dining options, and opportunities for cultural exploration that cater to their specific needs.

Sampling Technique

The target respondents for this study are Muslim respondents who have visited the Philippines, South Korea, or even both countries. They must be at least 17 years old, competent to make their own judgments, of various nationalities, and willing to answer a number of questions asked, including demographic data.

To ensure at least 100 responses, this survey will be circulated via Google Form to potential respondents from European, Asian, Australian, African, and American countries.

Analysis Methods

Content analysis will be used to evaluate responses from a large number of respondents from various countries. Content analysis is a research technique for drawing replicable and valid conclusions from text (or other meaningful things) in the context of its use [5].

The process of conducting content analysis includes coding, or breaking down, the text into manageable code categories for analysis. Once the text has been coded into code categories, the codes can then be further classified into "code categories" to summarize the data even further.

Findings and Discussion

This section will include a descriptive profile of the respondents who participated in this study. The findings of a content analysis of Muslim travelers' intentions to visit the Philippines and South Korea will be presented, with comparisons made. These findings will be presented in a summary table.

These findings will be explored in order to interpret their meaning, investigate their implications, and compare them to previous study findings and theories. The significance of the findings will be discussed and linked to the research questions.

By analyzing the findings of this research, non-Muslim countries may be able to better understand and accommodate the specific needs and desires of Muslim tourists more effectively.

Conclusion

In this final section, research questions will be restated and overall findings will be presented to identify Muslim travelers' intention to travel to non-Muslim countries, particularly the Philippines and South Korea. Policymakers in the Ministry of Tourism in South Korea and the Philippines will be presented with recommendations on how to handle the issues they continue to face.

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The Evaluation of Level of Satisfaction of Businesses Houses with the Third- Party Logistics Service quality in context of Nepal

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Abstract

Most of the business rely on the third-party logistics (3PL) for the fulfillment of their logistics activities. The inward logistics such as raw materials and other products for the manufacturer and the finish products for trader and outward logistic such as the finish goods from manufacturer to trader and trader to the final consumer the business needs to rely on third-party logistics. This article evaluates the level of satisfaction of manufacturers and traders of Nepal in the service provided by the third-party logistics. The data collection is based on primary source from the different businesses in Nepal.The results shows that logistics service speed is the most important determinant of customer satisfaction and that the importance of risk perception is the lowest. Moreover, the accuracy of a service rate is satisfied at the highest level and the integrity of goods is satisfied at the lowest degree. This paper contributes by designing the specific measures and uncovering the determinants to improve the customer satisfaction of third-party logistics service provider.

Keywords: *Third party logistics,Logistics Service Quality, Customer Satisfaction, Evaluation*

Background

Supply chain management (SCM) is the active management of supply chain activities to maximize customer value and achieve a sustainable competitive advantage. It represents a conscious effort by the supply chain firms to develop and run supply chains in the most effective & efficient ways possible. Supply chain activities cover everything from product development, sourcing, production, and logistics, as well as the information systems needed to coordinate these activities.

The concept of Supply Chain Management (SCM) is based on two core ideas:

1. The first is that practically every product that reaches an end user represents the cumulative effort of multiple organizations. These organizations are referred to collectively as the supply chain.
2. The second idea is that while supply chains have existed for a long time, most organizations have only paid attention to what was happening within their "four walls." Few businesses understood, much less managed, the entire chain of activities that ultimately delivered products to the final customer. The result was disjointed and often ineffective supply chains.
3. The organizations that make up the supply chain are "linked" together through physical flows and information flows.

Logistics

The terms logistics and supply chain management (SCM) are frequently used interchangeably because of their close relationship. Even so, despite their similarities, they are not the same. Understanding the differences between supply chain management and logistics is crucial for businesses to maximize productivity and profitability. An overview of supply chain management and logistics will be given in this section, along with information on how they differ and how they can be used to enhance business operations.

Planning, implementing, and controlling the effective flow of goods, services, and related information from the point of origin to the point of consumption in order to satisfy customer needs is the definition of logistics. It entails the coordination of all tasks involved in moving goods from one location to another. This covers delivery, storage, inventory control, packaging, and other associated tasks. Logistics is concerned with the financial and practical aspects of moving goods from one location to another.

Logistics has become one of the fastest growing industries in every economy. Due to its significant role in achieving competitive advantages, outsourcing logistics activities to a third party is an emerging trend in the modern world.

Third-Party Logistics (3PL)

Third-Party Logistics, is a service that takes on the responsibility of managing various logistics functions on behalf of businesses. This includes a wide range of

services such as intermodal transportation, warehousing, order fulfilment, and inventory management. The primary goal of 3PL providers is to enhance efficiency, reduce costs, and improve overall supply chain operations.

The 3PL process is a well-oiled machine that starts with businesses outsourcing their logistics needs to a specialised provider. These providers leverage their expertise, technology, and infrastructure to manage everything from storing goods in warehouses to transporting them to their final destination. The beauty of 3PL is its flexibility and scalability, adapting to the unique requirements of each business.

Lieb, Et Al. (1993) Defined 3PL as

"Third-party logistics involves the use of external companies to perform logistics functions that have traditionally been performed within an organization. The functions performed by the third party, can encompass the entire logistics process, or selected activities within that process" (p.35).

According to this definition, third party logistics providers, add value to their customers, by providing any form of externalization of logistics activities previously performed "in-house", like transportation activities, integrated warehousing, distribution, forwarding, packaging, customs handling, kitting, and information management activities.

The Council of Supply Chain Management Professionals (CSCMP)'S Formal Definition of Third Party LogisticsProvider is as Follows

"A firm which provides multiple logistics services for use by customers. Preferably, these services are integrated,or "bundled", together with the provider. These firms facilitate the movement of parts and materials, from suppliers tomanufacturers and finished products from manufacturers, to distributors and retailers. Among the services which theyprovide are transportation, warehousing, cross-docking, inventory management, packaging and freight forwarding"(CSCMP, 2009, online).

The advantages of utilising 3PL solutions services are plentiful. For one, it leads to significant cost savings. ٣PL providers benefit from economies of scale, allowing businesses to reduce their logistics expenses. Additionally, these experts offer specialised knowledge and technology that can lead to improved customer service and operational efficiency. Real-world examples showcase how companies have achieved remarkable success through ٣PL partnerships. There more than 75 3PL operating in Nepal.

Mostly used 3PL service provider in Nepal as follows,

1. Sugam Transport Pvt. Ltd
2. Pashupati Road Carriers Pvt. Ltd
3. JB Transport Pvt. Ltd
4. IP Roadlines Pvt. Ltd
5. Transport Corporation of India (TCI)
6. Jay Mata Transport Pvt. Ltd
7. DHL
8. Aramax
9. Fedex
10. DTDC
11. Atlas De. Cargo
12. Flash Freight logistics
13. Nepal Shipping and Air logistics
14. Total Logistic and many more

Objectives of the Research

The objective of this article is to evaluate the level of satisfaction of different organizations towards the services provided by Third–Party logistics Service Provider in context of Nepal.

Literature Review

Logistics has become the indispensable activity in the organization to make goods and service available to the final custom. But performing the same by the company itself has become impossible. Thus, outsourcing or subcontracting a business activity, which was previously being performed by the organization itself, has gained a lot of attention by the leading firms. Due to the tough market competition the companies are compelled to take the assistance of many vendors and outsource the service provided by them which are not their main activities.; Davis B.R. & Mentzer J.T. (2006).

Bagchi and Virum (1996) acknowledged that, the high level of integration between the 3PL provider and itscustomers, and between the performed functions. Furthermore, there is a common feature of 3PL, as being a long-termrelationship, the customer and a provider encompassing the delivery of, a wide range of logistics needs. In a logisticsalliance, the two parties regard each other as partners and both the partners; take part in designing and developing logisticssolutions and measuring performance (Skjoett-Larsen, 2000). The primary goal is to achieve a win-win arrangement.

Third party logistics are also referred to as, outsourced or contract logistics.Third-party logistics refers to an external logistics service provider that oversees various outsourced tasks for the benefit of the shippers or customers, aiding in their business operations. This category encompasses activities such as outbound transportation, warehousing, inbound transportation, auditing and settling freight bills, handling customs brokerage, forwarding freight, and facilitating customs clearance for the customer."Rushton& Walker (2007)".

There are a number of terms representing "third party logistics" which include "logistics outsourcing," "logistics alliances," "contract logistics," and "contract

distribution". These terms have been used interchangeably to describe the organizational practice of contracting-out part of or all logistics activities that were previously performed in-house (Sink, Langley, & Gibson, 1996). It is an established fact that no industry or company can continue to maintained market position unless it adopts best practices in all fields of its operations. Among various available measures, 3PL is commonly considered policy that enables an organization to achieve a sustained status in the comity of its relevant industry. According to Knemeyer and Murphy (2004), 'third-party logistics' can be referred to as 'logistics outsourcing' or 'contract logistics'. Third party logistics offers an 'all in one solution for assembly, packaging, warehousing & distribution. Contemporary 3PL arrangements are based on formal (both short- and long-term) contractual relations as opposed to spot purchases of logistics services By availing 3PL services, businesses can enjoy quite reliable logistics advantage over the competitors and maximize profitability through combined effect of knowledge and resources (Murphy &Poist, 1998).

Third party logistics providers are offering advanced information technology and broader global coverage. So companies need a state-of-the-art third party logistics provider with a wealth of information technology deployment experience to achieve optimal information flow to efficiently integrate the supply chain (Vaidyanathan, 2005). Information Technology has automated most of the routine logistics activities that enables managers to focus on strategic issues and core competencies. These activities such as warehousing, packaging, and distribution, are enabled and supported by the use of Information Technology (Lewis and Talalayevsky, 1997).

Vaidyanathan (2005) identified a rapid increase in the number of companies that outsource their logistics activities to Third Party Logistics (3PL) providers, to concentrate on their core competencies. Organizations mostly outsource their logistics activities to move ahead with low cost structures. Rahman(2011), found that lowering expenses, cutting down on capital spending, improving adaptability, gaining entry to new markets, acquiring new technologies, and concentrating on primary operations were key motivators for outsourcing. Further, Premarathne (2012) highlighted that outsourcing logistics operationslowers excess inventory, production costs, lead times,

shortages of resources, overhead expenses, and improves production flexibility and quality, all of which allow for a better focus on the main business. A wide range of services are offered by third-party logistics companies, such as order fulfillment, rate negotiation, carrier selection, inventory management, product assembly, order processing, warehouse management, fleet management, reverse logistics, and shipment consolidation.

Sheikh & Rana (2012) pointed out that third party logistics providers are immensely helpful to enhance customersatisfaction as they support to integrate different processes of supply chain, using advanced tools in InformationTechnology. As highlighted by Srinivasan, Kekre& Mukhopadhyay (1994), to increase the shipment performanceof suppliers and decrease uncertainty, sharing of information between the supply chain members should besignificantly enhanced and improved using Electronic Data Interchange (EDI) technology in the supply chain

system. Even Lewis &Talalayevsky (2000) identified that transaction cost between the supply chain partners can bedecreased and some complications can be handled using advanced information technology tools and engage insignificant improvements in Information Technology.

Research Methodology

As per the below mentioned conceptual framework, the customer satisfaction level was measured on the six independent variables. The independent variables were the speed of delivery, price charged, attitude of the service provider, accuracy and integrity of the company, timeliness and accuracy in the flow of information and overall service quality.

CONCEPTUAL FRAME – FIG - 1

The study is based on primary and secondary data. In this research paper the primary data is collected directly through the personal interview and questionnaire google form sent to the respondentsfrom 15 leading organizations operating in Nepal.There are total 135 respondents from the 15 companies on average of 8 to 10 employee working in logistics department. The organizations selected from all the sectors like manufacturing companies like detergent industries, frozen food product industry, scaffolding clamps industry as well as hydro mechanical industry were as different import-based trading houses for hardware and sanitary, motorcycle and car importer, heavy equipment companies, bridge accessories, different construction, and FMCG product in Nepal. The secondary data is collected from the Annual report, newspapers, websites etc.

The responses from eachorganizationare consolidated and calculated average response of that company's employee and again the mean of all the 15 organizations is calculated.

The questionnaire is based on a Likert scale **of 1-Strongly Satisfied, 2- Satisfied, 3-Neutral, 4- Dissatisfied, and 5-Strongly dissatisfied**

Analysis and Response

1. The first part of the question is about the speed of delivery by the 3PL service provider. In this question researcher tried to find the response regarding the timely delivery of consignment to the client. The consolidated average response of all the 15 organization is as follow,

Logistics service speed of delivery

Company Response	a. Our 3PL service provider delivers the consignment at an estimated time.	b. Our 3PL service provider provides pickup service	c. Our 3PL service provider provides stop-to-stop movement very fast without any halt.
Mean	**2.6**	**2.87**	**2.8**

According to the above response on the speed of delivery the company has neutral response all the question on timely delivery, pickup service and halt on stop-to-stop movement. The result is 2.6, 2.87 and 2.8 nearly 3 which means neither the respondent is satisfied nor dissatisfied. On the in-depth interview on the above matter, the respondent suggested that the speed of delivery can be improved by the proper monitoring the movement of the truck. The trucks are taking move than average time to reach the destination.

2. The second part of the question is about price charged by the 3PL. In this question researcher tried to find the response regarding the price charge by the 3PL companies in Nepal. The response is as follows,

Logistic Service Price related

Company Response	a. The price charged by 3PL is reasonable for the service provided	b. The price charged by 3PL is very competitive with the market price
Mean	**2.6**	**2.33**

According to the above, result is 2.6 and 2.33 which means the companies are neither satisfied nor dissatisfied by the price charged by the 3PL companies in Nepal. Some companies have positive response and some has negative. They suggested that by the proper management of logistics activities the price can be decreased. But on the question relating to the competitive market price all the companies are satisfied by what they are charged by their 3PL service provider.

3. The third part of the question is about the attitude of the 3PL service provider. In this part the researcher tires to find out the intention of 3PL service provider intention towards maintaining good relation with their companies.

3PL service provider attitude related

company Response	a. The 3PL service provider has maintained a good relationship with us.	b. They are very polite in their dealing.	c. They apologize for any mismanagement during the delivery of the consignment.
Mean	2.53	2.53	2.33

Hence, the above result is 2.53 on maintaining good relation and polite dealing with the clients. The companies are neither satisfied nor dissatisfied with the relationship. More can be done by maintaining the good relationship. Whereas, the result of third question regarding apology on mismanagement is 2.33 which means the organizations are satisfied by the dealing of 3PL on certain mis-management.

4. The fourth part of the questionnaire is about the accuracy and integrity of 3PL service provider. The researcher tries to find out the weather the service provider fulfil their commitment or not as well as their integrity of non fulfilment of commitment.

Logistics service accuracy and integrity

company Response	a. They deliver the consignment in a timely manner.....	b. They deliver the safely without any damages.	c. They have an efficient negotiation process regarding the damaged consignment received
Mean	2.2	2.4	2.47

The result on the accuracy and integrity is 2.2, 2.4 and 2.47 which is near to 2 which means all the companies are satisfied with the accuracy and integrity of 3PL service provider.

5 The fifth part is the questionnaire is regarding the flow of information i.e., tracking facility of the consignment. The researcher tries to know the level satisfaction by the tracking system of the 3PL.

Logistics service information system

Company Response	a. Our 3PL service provider has a proper information system to track our consignment.	b. They provide all the consignment-related information on a timely basis, without any delay,	c. The information updated by them is accurate
Mean	2.67	2.67	2.67

The result on the 3PL service provider information system is 2.67, 2.67, 2.67 in all three the question which is near to 3 which means all the companies are neutral to the information system of the 3PL companies. The some of the 3PL companies maintain the tracking system but not able to maintain it properly.

6. Finally, the overall satisfaction level of companies towards the service provided by of 3PL companies was measured.

Overall Service quality

Company Response	a. The overall service provided by the 3PL service provider is quality service
Mean	2.13

The result found is 2.13 which is near to 2 means the companies taking the facilities of 3PL companies are near to satisfied by the service provided by them.

Annex-1 – ANOVA TABLE MENTION BELOW

According to the below mention Annex-1 ANOVA Table, the responding companies were of four different natures of business. There were manufacturing industries, steel fabrication industry, trading houses and distributorship companies. The below mentioned table shows the significance of 0.5 on all the questionnaire asked to the companies which means all the companies maintain the same level of satisfaction towards the service provided by the 3PL companies.

Conclusion and Recommendation

From the above data analysis, it was found that on an average the customers are in the position of neither fully satisfied nor dissatisfied from the service provided by the 3PL companies. In some issues the companies and satisfied whereas they are neutral or dissatisfied in some issues.

In the last questionnaire the respondent were asked to give their suggestion for the betterment of service quality of 3PL company. It was assumed that the suggestions received from customer can be very crucial for 3PL company to improve their service quality and increase the level of customer satisfaction. Numbers of important suggestions and requirements were received from the companies for the improvement of 3PL service quality.

Some customers suggested the 3PL companies to have a proper information system to be installed so that they can

properly inform their customer about the movement of the consignment from one point to another. Even they suggest to have an arrangement to track the live location of the consignment. Other customers suggested to revise the price for the movement of consignment. Even they suggested to finalize the price before dispatch of consignment. Whereas some other customer also suggested the 3PL companies to maintain the proper equipment for the handling of consignment to rid of any damages. Other customers were more concern about the time of delivery. They emphasized that the time is money. So, the 3PL companies should focus on timely delivery of consignment.

In the gist, to enhance the level of customer satisfaction the 3PL companies should work on the above suggestions provided by the customer. They should try to incorporate the above suggestions in their management which will definitely help them to improve the service quality and increase the satisfaction level of customer.

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Annex -1

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
a. Our 3PL service provider delivers the consignment at an estimated time.	Between Groups	2.711	3	.904	.771	.534
	Within Groups	12.889	11	1.172		
	Total	15.600	14			
b. Our 3PL service provider provides pickup service	Between Groups	2.094	3	.698	.491	.696
	Within Groups	15.639	11	1.422		
	Total	17.733	14			
c. Our 3PL service provider provides stop-to-stop movement very fast without any halt.	Between Groups	.511	3	.170	.158	.923
	Within Groups	11.889	11	1.081		
	Total	12.400	14			
d. Our 3PL service provider delivery service is	Between Groups	2.711	3	.904	.913	.466
	Within Groups	10.889	11	.990		
	Total	13.600	14			
a. The price charged by 3PL is reasonable for the service provided.	Between Groups	.600	3	.200	.200	.894
	Within Groups	11.000	11	1.000		
	Total	11.600	14			
b. The price charged by 3PL is very competitive with the market price	Between Groups	1.111	3	.370	.399	.757
	Within Groups	10.222	11	.929		
	Total	11.333	14			
a. The 3PL service provider has maintained a good relationship with us.	Between Groups	.511	3	.170	.109	.953
	Within Groups	17.222	11	1.566		
	Total	17.733	14			
b. They are very polite in their dealing.	Between Groups	.511	3	.170	.088	.965
	Within Groups	21.222	11	1.929		
	Total	21.733	14			
c. They apologize for any mismanagement during the delivery of the consignment.	Between Groups	2.333	3	.778	.778	.531
	Within Groups	11.000	11	1.000		
	Total	13.333	14			
a. They deliver the consignment in a timely manner.....	Between Groups	1.650	3	.550	.266	.849
	Within Groups	22.750	11	2.068		
	Total	24.400	14			
b. They deliver the safely without any damages.	Between Groups	4.044	3	1.348	1.094	.392
	Within Groups	13.556	11	1.232		
	Total	17.600	14			
c. They have an efficient negotiation process regarding the damaged consignment received	Between Groups	4.178	3	1.393	1.603	.245
	Within Groups	9.556	11	.869		
	Total	13.733	14			
a. Our 3PL service provider has a proper information system to track our consignment.	Between Groups	1.444	3	.481	.242	.865
	Within Groups	21.889	11	1.990		
	Total	23.333	14			
b. They provide all the consignment-related information on a timely basis, without any delay,	Between Groups	4.333	3	1.444	.935	.457
	Within Groups	17.000	11	1.545		
	Total	21.333	14			
c. The information updated by them is accurate	Between Groups	3.444	3	1.148	.795	.522
	Within Groups	15.889	11	1.444		
	Total	19.333	14			

Reclamation of Desert with Regular Application of Waste Water

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Abstract

Deserts around the world mostly do not have plants and are ever- expanding their area each year. There is shortage of food and prevalent hunger around the world mostly in the African countries that have desert. The waste water is not properly managed in those places and it causes disease outbreaks. So, the problems of desertification, waste water management and hunger have to be addressed by the world community. This thesis work tries to explore a possibility of reclamation of deserts with regular application of waste water. The results obtained from a four months long test are very encouraging and it can be easily concluded that the deserts can be reclaimed by application of waste water and it will relieve the desert community from the burden of costly treatment of waste water as well. In turn, they will, to some extent, get rid of water borne diseases and the reclaimed land could be used in future to produce more food to feed the hungry community- positively impacting directly to food security of the focused community.

Keywords: *Desert Reclamation, Waste Water Treatment, Recycling, Hunger, Diseases*

1. Introduction

1.1 Background

The scarcity of water resources and the growing threat of desertification are global environmental concerns that pose significant challenges to sustainable development. In many arid and semi-arid regions, including Middle East, North Africa and even Deserts in China and Mongolia as well. The availability of fresh water is limited, while the expansion of deserts continues to degrade valuable land and ecosystems. These pressing issues necessitate innovative approaches to water management and desert reclamation.

Deserts are characterized by arid and extreme environmental conditions, such as high temperatures, low humidity, and limited water availability. These factors significantly influence the growth and survival of plants in deserts. The primary reason for the scarcity of plants in deserts is Water Scarcity and other reasons are; High Evaporation Rates due to less relative humidity, Sandy and Unstable Soil, Temperature Extremes, Competition for Resources and Adaptations [1]

The treatment and application of waste water offer a promising solution to address both water scarcity and desertification. Waste water, which includes domestic, industrial, and agricultural effluents, is often discarded without adequate treatment, resulting in pollution and a waste of potential resources. However, when properly treated, waste water can be a valuable source for moisture enhancement in the deserts and ecosystem restoration in arid regions, supporting sustainable agriculture and mitigating desertification.

In the context of Middle East and North Africa (MENA), which experiences water scarcity and faces the risk of desertification, there is a need to explore the feasibility and effectiveness of natural treatment of waste water with its application in desert reclamation. By conducting research on a test plot that simulates desert-like conditions, valuable insights can be gained into the potential benefits, challenges, and environmental impacts of utilizing untreated waste water for reclamation purposes. It is important to note that the formation of deserts is a complex and multifaceted process influenced by a combination of factors. The specific characteristics and formation mechanisms can vary for different deserts around the world.[2]

1.2 Literature Review

The study aims at converting the sand into sandy soil and thus, composition of sandy soil must be known.

1.2.1 Sandy Soil and it's Composition

Soil types can be complex and vary significantly based on regional factors. A general overview of Sandy Soil is as following:

Mineral Matter: Primarily consists of sand particles.

Organic Matter: Generally lower in organic content.

Water: Drains quickly due to large pore spaces between sand particles.

Air: Good drainage and aeration.

The composition of sandy soil can vary based on factors such as location, climate, and land use. Here's a general range of the fractions of minerals, organic matter, water, air, and silt typically found in sandy soil:

a. **Minerals:**

Sand Particles: Sandy soil is primarily composed of sand-sized particles, with a diameter between 0.05 mm and 2.0 mm. The sand fraction makes up the majority of the soil, ranging from around 70% to 90% or more.

b. Organic Matter:

The organic matter content of sandy soil is generally lower compared to other soil types. It might range from about 0.5% to 3% or more. Organic matter contributes to soil fertility and water-holding capacity.

c. Water:

Sandy soil has relatively low water-holding capacity due to the large pore spaces between sand particles. The water content might range from 5% to 20% when fully saturated.

d. Air:

Sandy soil provides good drainage and aeration due to its large particle size. The air-filled porosity might range from 30% to 50% or more, depending on factors like compaction and water content.

e. Silt and Clay:

Sandy soil generally has a very low proportion of silt and clay-sized particles. The silt content might range from 1% to 10%, while the clay content is typically less than 5%.

1.3 **Objective**

1.3.1 Research Aims

The research aims at investigating the following key aspects:

a. **Reclamation of Desert:** The research will examine the impacts of continuous application of untreated waste water on soil quality and ecosystem dynamics in a simulated desert-like environment.

b. **Waste Water Treatment:** Waste Water Treatment is secondary aim of this research. It can be considered as a natural outcome during the process of reclamation.

The outcomes of this research have significant implications for water resource management, land restoration, and environmental sustainability in arid and semi-arid regions facing similar challenges. Ultimately, the research aims to contribute to the development of sustainable approaches for water utilization and land management, fostering resilience and combating desertification in arid regions.

1.3.2 Research Objectives

The following are the research objectives:

a. To evaluate the potential of untreated waste water for desert reclamation by studying its effects on soil quality in a simulated desert-like environment.

b. To provide evidence-based recommendations for the integration of waste water treatment and reclamation strategies in arid and semi-arid regions, with an experiment conducted in a simulated test plot in Kathmandu, Nepal.

0.2.3 **Research Questions:**

a. How do the findings from this research contribute to the broader understanding of waste water utilization and desert reclamation in arid and semi-arid regions?

b. How does the application of untreated waste water influence soil quality parameters, including soil composition and nutrient levels, in a simulated desert-like environment?

These research objectives and questions provide a framework for the potential benefits and challenges of utilizing raw waste water for desert reclamation and waste water treatment. They guide the study towards generating knowledge and insights that can inform decision-making and contribute to sustainable water resource management and land restoration efforts.

The previous research on desert reclamation and waste water utilization has provided valuable insights into the potential of using treated waste water as a resource for land restoration in arid regions. But, none of those have used untreated waste water so far.

The benefits, challenges, and risks associated with waste water utilization has been explored and it has contributed to the development of sustainable strategies for desert reclamation. However, there is a need for further research to address specific regional variations, optimize treatment processes, and develop tailored approaches to suit the diverse desert environments worldwide.[3]

Desert soil consists of almost 90- 95% of sandy soil in low-rainfall regions. The nitrogen content is low and organic matter is also negligible but, is rich in calcium carbonate and phosphate and that makes it infertile. If nitrogen could be available in the form of nitrates from fertilizer and proper irrigation, in addition to the already-present phosphates makes it useful in growing crops such as barley, rape, cotton, wheat, millets, maize, and pulses.[4]

The proposed research focusses on utilization of raw waste water and see the results.

0.3 **Scope and limitations**

0.3.1 **Scope**

a. **Geographic Scope:** The study is being conducted in Kathmandu, Nepal, as the research site for investigating waste water treatment and reclamation

of deserts. The geography of deserts and lush green Kathmandu is entirely different. It involves the selection and establishment of a test plot that is prepared simulating desert-like conditions within the test area.

b. **Desert Reclamation:** The study assesses the potential of using raw waste water for desert reclamation by examining its effects on soil quality, vegetation growth, and ecosystem dynamics. It aims at providing insights into the viability and success of utilizing untreated waste water for land restoration in arid environments.

0.3.2 Limitations of the Study:

a. **Generalizability:** The research findings and recommendations may have limitations regarding their generalizability to other regions or contexts beyond Kathmandu, Nepal. The specific environmental, climatic, and socio-economic conditions of the study area may, somehow, influence the results and a customized approach should be adopted when applying the findings to different climatic and geographic locations.

b. **Time Constraints:** The study has faced limitations in terms of the time available for research activities and data collection as the beginning 2 years were seriously affected by COVID19 pandemic. Conducting long-term experiments and monitoring processes are essential for capturing the full effects of waste water application on desert reclamation. However, duration of the study has been constrained by practical time limitations of submission of this draft thesis report and resources availability.

c. **Scale of Implementation:** The research focuses on a test plot of just 1 square meter area within Kathmandu, Nepal owing to the cost of construction of a larger test plot.

d. **In- situ Variations:** Consequently, the findings may not fully represent the potential outcomes and challenges associated with implementing waste water treatment and reclamation on a larger scale. The scalability and practicality of the proposed approaches should be further evaluated in the context of broader implementation scenarios, i. e. at the hot desert itself.

e. **Ethical Considerations:** The study involves the use of waste water and potential environmental impacts. It is important to adhere to ethical guidelines and regulatory frameworks for waste water treatment, land use, and environmental protection. Limitations could have arisen in terms of balancing scientific research objectives with ethical responsibilities and ensuring compliance with relevant regulations. But, it was not an issue as the premise itself is a site for waste water treatment of Kathmandu.

f. **Technical Limitations:** The study may have encountered technical limitations related to waste water treatment technologies, data collection methods, and analysis techniques. These limitations could have affected the accuracy and precision of the results obtained and may have required careful consideration and appropriate measures to mitigate potential biases or uncertainties. No test bores were drilled to collect the infiltrated applied waste water as there is a science- backed and an established procedure of waste water treatment by land application. The waste water that percolated below the test plot was considered well- treated because of the established procedure of waste water treatment. It was also considered not necessary because the deserts have 100s of meters of thick sand layers and the temperature is also very high helping the applied waste water get treated in few hours during percolation.

Despite these limitations, the study offers valuable insights into reclamation of deserts in a desert- like simulated model (a test- plot) and waste water treatment in Kathmandu, Nepal. It contributes to the existing knowledge base on sustainable water resources management, land restoration practices, and the potential of waste water utilization in arid environments.

1 Materials and Methods

1.1 Research design and approach

The research was designed to be conducted in 2020 but, the COVID 19 pandemic (late 2019- beginning of 2023) delayed the research at field level. The researcher tried to find out a place in nearby deserts of India to conduct the research at field level. But, the regulations of the Government of India were very difficult to a foreigner to fulfil. Then, the researcher tried to find space in Ethiopia and seek some donor support for the research but, again it failed because of lack of interest of the donors. The researcher even presented this idea to United Nations' Convention for Combatting Desertification (UNCCD).

This UN Agency is custodian of Sustainable Development Goal (SDG) target 15.3: "By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world." In the beginning they were very much interested. But, it could not, somehow, materialize. The researcher floated this idea through LinkedIn to garner support and funding. A Professor of South Africa was interested and she passed on a contact for further discussion. But, that contact person did not respond properly.

So, this research got delayed. Finally the Researcher aimed at replicating desert- like condition in Kathmandu with an experimental set up at Bagmati Sewerage Treatment Plant in Kathmandu, Nepal.

1.2 **Study area description and selection of the test plot**

A continuous supply of waste water was needed for this research and thus, the research plot was selected just next to the inlet portion of Bagmati Sewerage Treatment Plant of Kathmandu Valley near the international airport.

1.3 **Simulation of desert-like conditions**

A desert is a barren and arid region characterized by a lack of significant vegetation and limited precipitation. It is a geographical area that typically receives very little rainfall, making it difficult for plants and animals to thrive. Deserts often have extreme temperature variations, with scorching hot days and cool nights.

Deserts are generally classified based on their specific characteristics and location. Some common types of deserts include; Hot deserts, Cold Deserts, Coastal Deserts and Polar Deserts. The research is focused to the Hot Deserts only.

These Hot deserts, such as the Sahara Desert in Africa and the Arabian Desert in the Middle East, experience high temperatures during the day, often exceed 100°F (38°C). These have sparse vegetation and are normally composed of sandy or rocky terrain.

Aridity because of high temperature, sand as the bed and no vegetation cover at the surface were the three characteristics to be simulated. The experimental set up is described below.

1.4 **Waste water treatment techniques and processes**

The main treatment parameters for a waste water are Bio- chemical Oxygen Demand (BOD), Total Suspended Solids (TSS) and Nitrogen (N). The waste water treatment technique adopted was surface application of waste water on the sand bed of the test plot. With the passage of time it would percolate down to the sub- surface and get treated naturally. The suspended organic matters would get retained by the sand media and that would turn into humus like substance. Humus material is good for any soil as it harbors many micro- organisms that can break organic matters into inorganic and these are readily up- taken by the plan roots. The suspended inorganic substance (mostly silt) of the waste water would also get retained in the sand media and help the sand turn into soil with passage of time.

Some portion of the waste water would get evaporated because of high temperature maintained in the test plot in the day time to simulate summer temperature condition of the hot deserts. The Nutrients (Nitrogen, Phosphorous and Potassium- N, P, K) would also partially get retained in the sand media and make the sand rich of nutrients that could be helpful to the vegetation later.

1.5 **Experimental setup and data collection methods**

1.5.1 **Experimental Set up:** One square meter pit was created by excavating (Length = 1m and Breadth = 1m) of earth surface near the inlet of the waste water treatment plant up to a depth of 0.27m surrounded by single brick cemented wall from all four sides. A suitable area for the test plot was selected to ensure it was representative of the desert landscape. The area was cleared of debris and vegetation that could have interfered with the experiment. A test pit of volume Length (L= 1.092075 m) × Breadth (B= 1.092075 m) × Depth (D= 0.27 m) = 0.322 Cubic meter or 322 liters was excavated. A single brick masonry wall of 5 layers of bricks was constructed around the excavated pit to make the inner dimension up to ground level as L= 1 m, B = 1 m and D = 0.27 m giving a volume of 0.27 Cubic meters or 270 liters. Sand was filled up to a height of 4 brick masonry layers i. e. up to ground layer to keep one brick masonry layer as free board. The sand bed was levelled up to the 4 layers of bricks to create a consistent and uniform surface. A sample of the sand was collected in a plastic bottle and sent to the laboratory for analysis for its different composition like; Nitrogen (N), Phosphorous (P), Potassium (K), Organic Matter, Total Organic Carbon (TOC), Clay and Silt that are required to see the changes necessary for this research.

A roofing cover was provided to the test pit to avoid rainfall. The roofing cover was made of Iron frame covered by 50 micron thick plastic sheets on top and half of the sides. The lower open portion was fenced with Chicken wire mesh to avoid animals from tampering the test site. The enclosure thus prepared was provided with 10 nos. of 200 Watts capacity bulbs hanging from the frame at a height of 30 cms. from the sand surface to make the environment as hot as the desert. The temperature measured in different times varied from 45^0 C to 55^0 C. The temperature range exactly simulates the thermal condition of the deserts of India, middle-east and North Africa.

An Iron frame (Length = 1.5 m, Breadth = 1.5 m and Height = 2.0 m) made of angles and MS flats with four legs was fabricated and erected to cover the test plot with polyethylene sheet of 500 micron thickness as roofing and wall material. A photograph is shown below in figure 2.1:

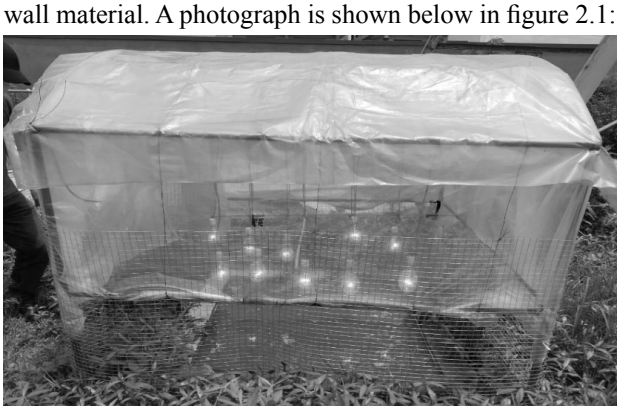


Figure 2.1: The test model with all the bulbs lit

The following Figure 2.2 shows application of waste water and measurement of ambient temperature at the test plot:

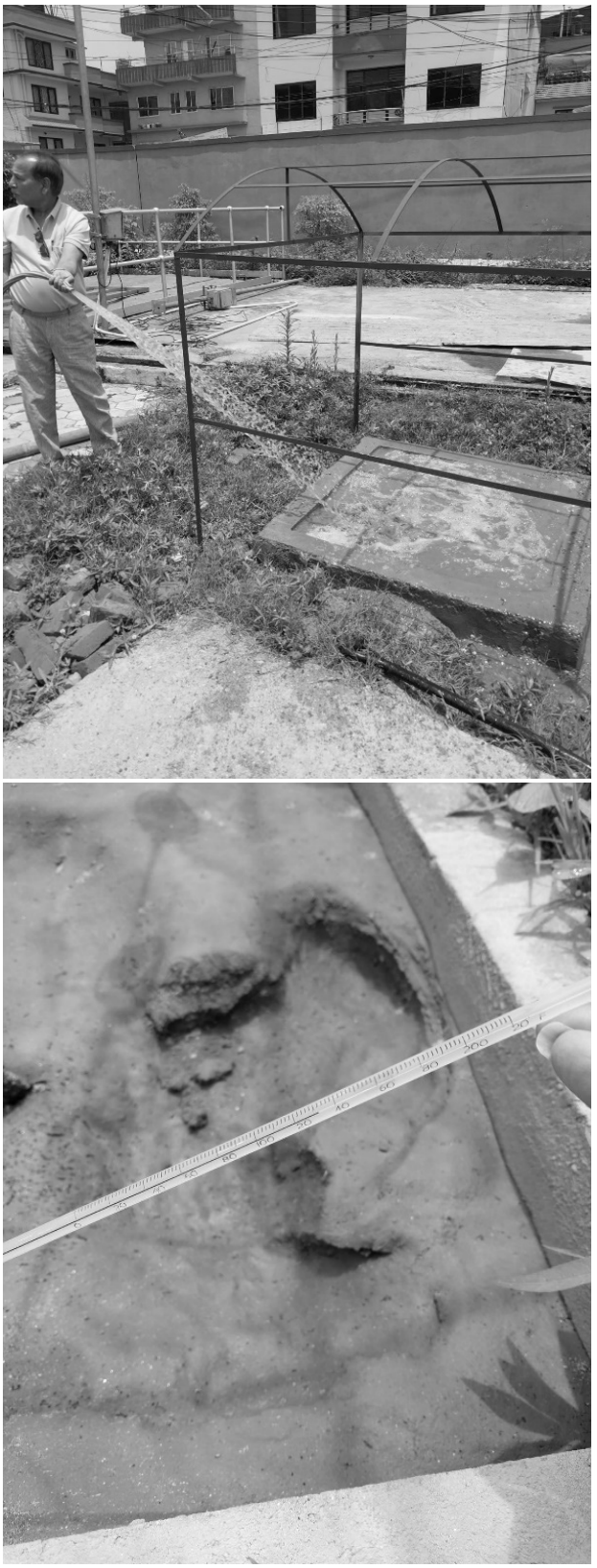


Figure 2.2: Application of waste water & Ambient Temperature measurement

2.5.2 Application of Waste water

The Electric Motor used for pumping waste water to apply had a discharge capacity of 10,000 liters per hour. An average time of 1 minute and 21 seconds took to fill the test plot. The maximum time taken was 1 minute and 30 seconds and the minimum was 1 minute 10 seconds. The average volume applied every day was 222 liters. The volume depends on factors such as the plot size, desired application rate, and the ability of the sand bed to absorb waste water. The Motor with plastic pipe was used to apply the waste water evenly over the entire test plot surface every day. It was ensured that the application was consistent and uniform to maintain the reliability of the experiment.

2.5.3 Data Collection: Two types of data have been collected as following:

i. Initial Characteristics of Waste water: The main parameters that were collected for 4 months are as shown, as an example, in the following **Table 2.1**:

Table 2.1: Daily Representative Characteristics of applied Waste Water

Raw Sewage (Composite)						
Date	**pH**	**BOD5**	**COD**	**TSS**	**NH3-N**	**O & G**
	-	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Method	**Digital pH meter (Hach)**	**APHA 5210-B**	**EPA Method 410.4**	**APHA 2540 D**	**EPA Method 350.1**	**APHA 5520 B**
05/21/23	6.96	389.4	818	415	62.7	63
05/22/23	6.87	374	1119	395	34.7	78

Source: Bagmati Sewerage Project Daily Records

ii. Measurement of Changes in Composition of Sand:

Monthly periodic (June 20, July 20, August 20 and September 20 of the year 2023) soil samples from the test plot were taken in a half liter plastics jar to analyze the changes in the composition and characteristics of the sand media with the application of waste water. The soil samples were analyzed for their physical and chemical properties. Important parameters include; pH, Temperature, NaCl content, Total Nitrogen, Total Phosphorous, Potassium, Organic Matter, Total Organic Carbon, Clay and Silt contents. The obtained test data from the laboratory were tabulated and bar charts were worked out for the changes in concentrations of these parameters. The changes over time (each month) were compared to the previous records.

2 Results and Discussion

3.1 Data Illustration and Explanation

The following table 3.1 shows the test records of the sand media in the beginning and in 1 month time interval each for 4 consecutive months:

Parameters	Initial, %	1Month, %	% Increase	2 Month, %	% In-crease	3 month, %	% Increase	4 month %	% in-crease
Nitrogen	0.001	0.046	4500.00	0.070	6900.00	0.130	12900.00	0.183	18200.00
Phosphorous	0.00025	0.014	5517.20	0.021	8416.00	0.046	18495.20	0.009	3583.60
Potassium	0.456	0.528	15.70	0.340	-25.43	0.509	11.45	0.359	-21.42
Organic Matter	0.060	0.532	786.67	0.139	131.67	1.420	2266.67	1.060	1666.67
TOC	0.035	0.310	785.71	0.081	131.43	0.820	2242.86	0.610	1642.86
Clay	0.015	0.023	53.33	0.025	66.67	0.022	46.67	0.032	113.33
Silt	0.023	0.031	34.78	0.033	43.48	0.032	39.13	0.034	47.83

Table 3.1: Test results of the sand media from the Lab

- MS Excel sheet has been used to analyze the data to identify trends and patterns related to changes in the sand sample of the bed. Bar charts have been drawn to see the changes of concentration of various recorded parameters.

The corresponding Bar chart of the **table 3.1** is shown below in **figure 3.1**:

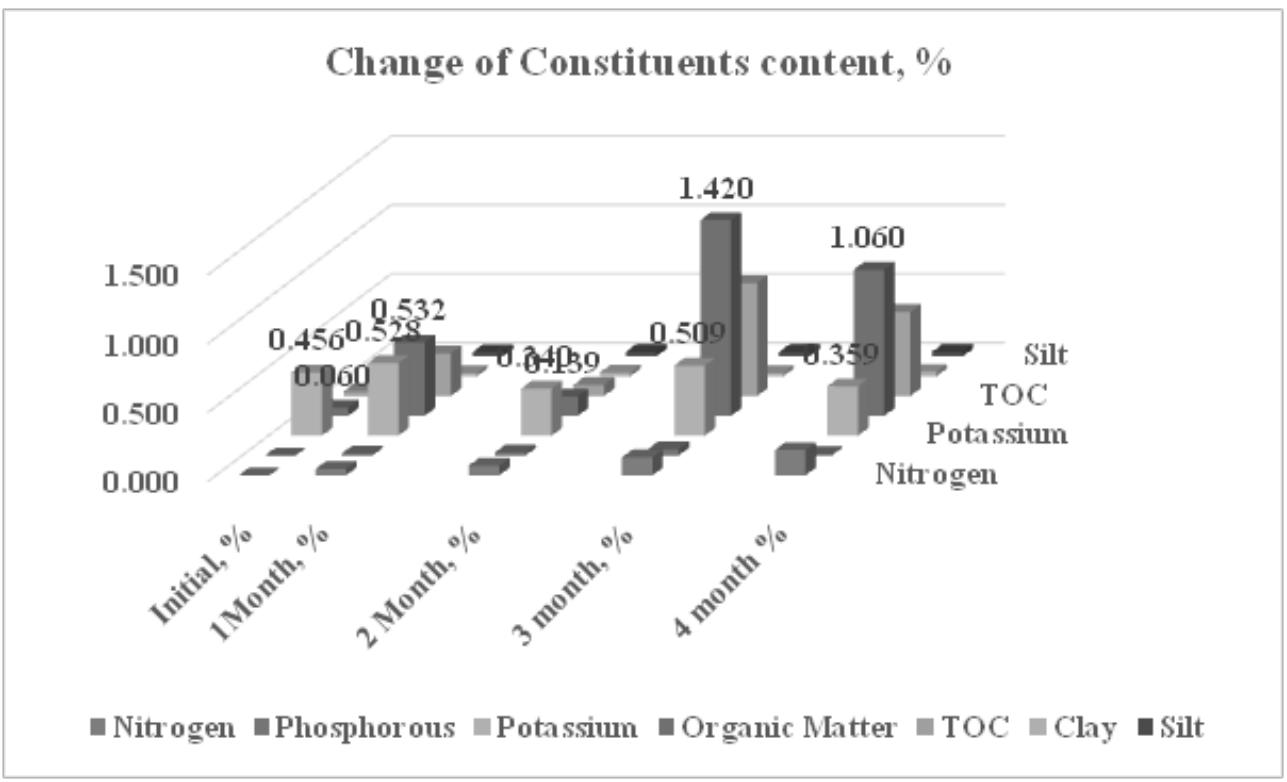


Figure 4.1: Cumulative Changes of all the parameters after each month of waste water application for 4 months

The following **table 3.2** shows the Increment percentage of each constituents and similarly the **figure 3.2** depicts the data in a graphical format:

	Initial, May, %	June, %	July, %	August, %	September, %
1. Nitrogen Content, %					
	0.001	0.046	0.070	0.130	0.183
2. Phosphorous Content, %					
	0.00025	0.014	0.021	0.046	0.009
3. Potassium Content, %					
	0.456	0.528	0.340	0.509	0.359
4. Organic Matter Content, %					
	0.060	0.532	0.139	1.420	1.060
5. Total Organic Carbon Content, %					
	0.035	0.310	0.081	0.820	0.610
6. Clay Content, %					
	0.015	0.023	0.025	0.022	0.032
7. Silt Content, %					
	0.023	0.031	0.033	0.032	0.034

Table 3.2: Increment Percentage of each constituents

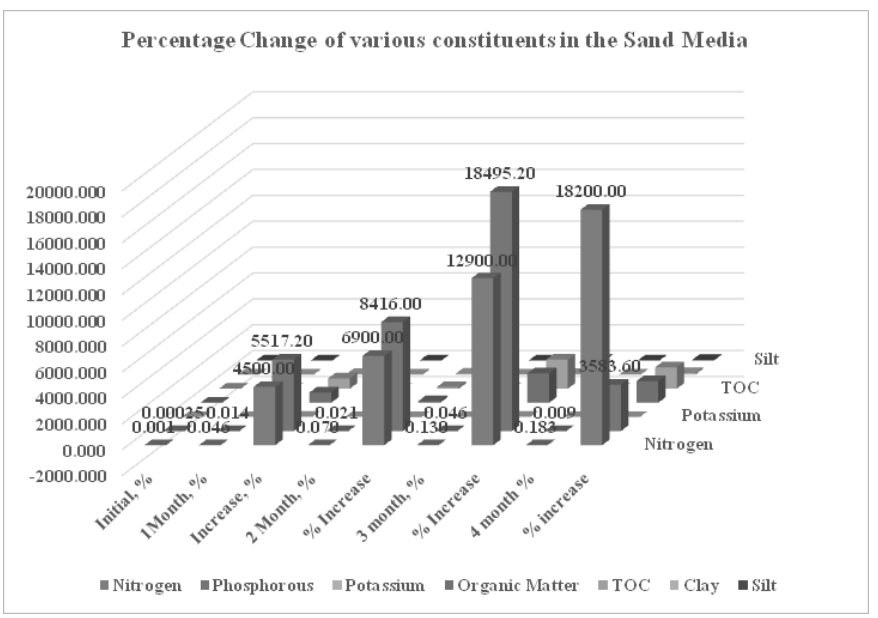
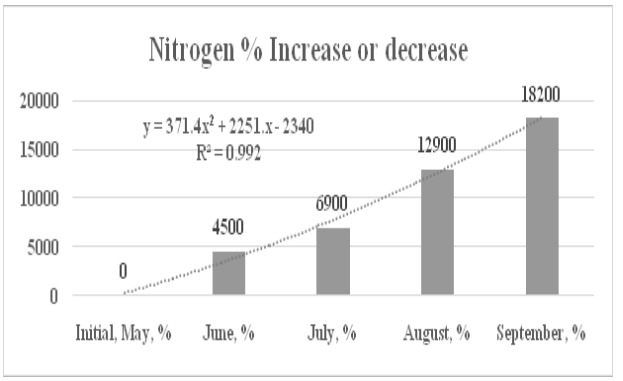
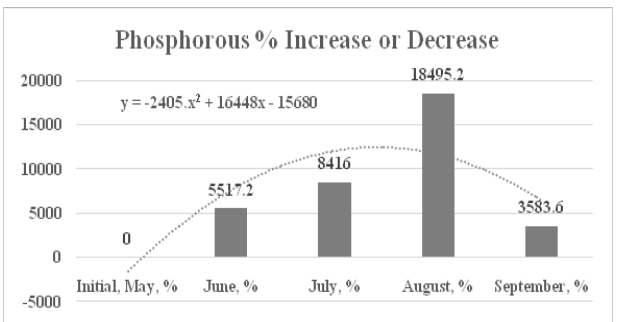


Figure 3.2: Increment Percentage of all the parameters after each month of waste water application for 4 months

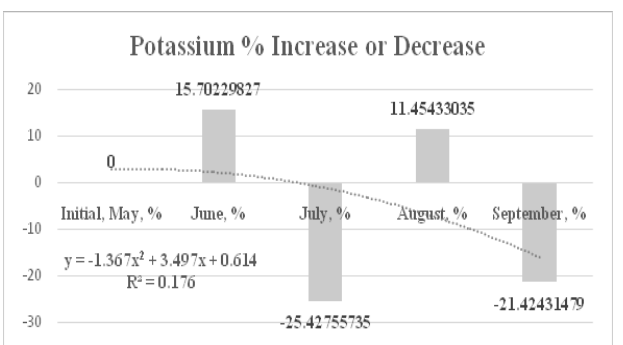
The following bar charts in Figure 3.3 clearly show the changes in the individual constituents of the sand bed after regular application of waste water to it as per above Table 3.2:



Nitrogen has increased by 4500% by the end of one month, 6900% by the end of second month, 12900% by the end of third month and by **18200%** by the end of fourth month of application of waste water.

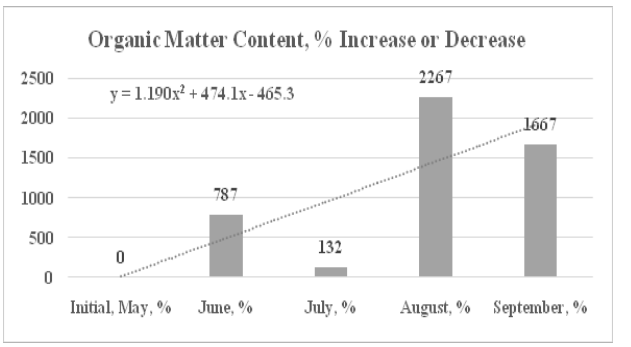


Phosphorous (P) has increased by 5517% by the end of first month, by 8416% by the end of second month, by 18495.2% by the end of the third month and by a sudden drop to 3583.6% was seen by the end of fourth month of application of waste water. But, still it is higher than that of initial level.

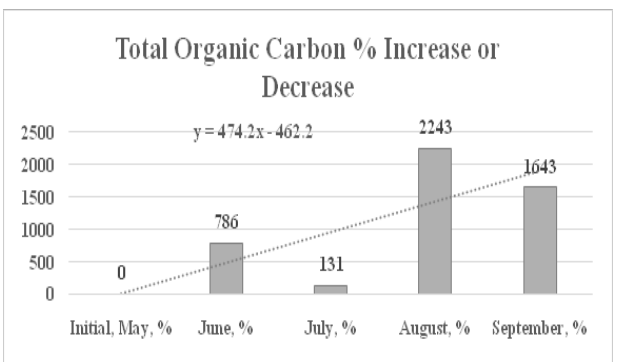


Potassium has increased by 16% in the first month of application but, it decreased to below 25% in the second month and it again recovered by 11.5% at the end of the third month and it again decreased by 21.4% at the end of fourth month of application of waste water. The decrease in the Potassium content in the second month may be because of peak rainy season (last 11 days of June and beginning 19 days of July is the peak monsoon period in Nepal). The heavy rainfall in Kathmandu may have led to dilution in content of potassium in the waste water and the regular application of dilute waste water could have leached out the already present potassium in the research plot.

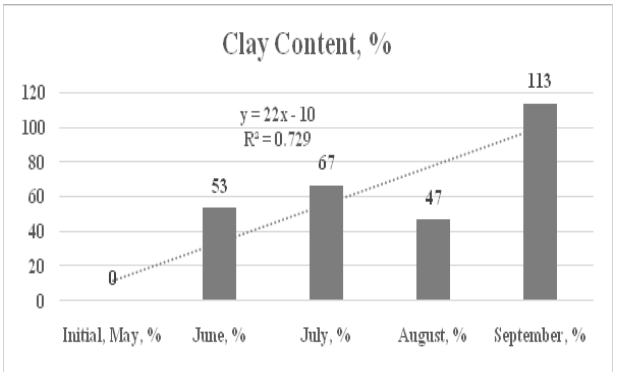
The monsoon season extended till October in the year 2023 in Kathmandu, Nepal and it could be the reason for further decrease in Potassium content in the test plot as the waste water was highly diluted. A further field level research is necessary to know the exact reason of variable results every next month.



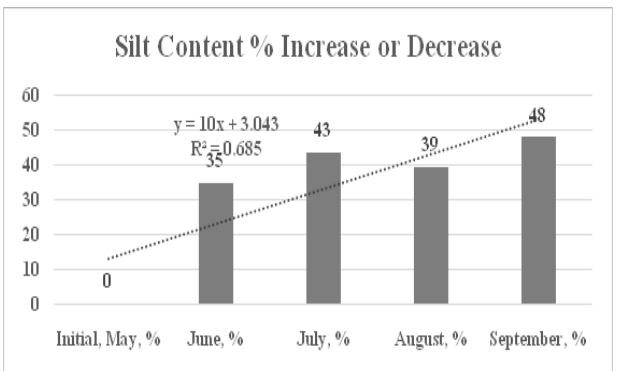
The organic matter has increased by 787% in the first month of waste water application but, it went down to 131.7% in the second month, it recovered back to 2267% at the end of third month and at the end of the fourth month it slightly decreased to 1667%. The reason of decrease in the second and fourth month could be the same as that mentioned above in case of Potassium. The fraction of organic matter at the end of 4 months is 1.06% as compared to 0.06% in the beginning. That is an increment of 1667% as compared to the sand sample at the beginning of the research.



The Total Organic Carbon (TOC) has increased by 786% in the first month of waste water application but, it went down to 131.4% in the second month, it recovered back to 2242.9% at the end of the third month and again slightly went down at the end of the fourth month. The fraction of TOC at the end of 3 months is 0.61% as compared to 0.035% in the beginning of the research. Thus, it is an increment of 1643% as compared to that in the beginning.



The content of clay has increased by 53% with a month of application of waste water and it further increased to 66.7% at the end of second month but, it went down slightly at the end of the third month to 46.7%. But, again it jumped to 113% at the end of the fourth month. The fraction of clay at the end of fourth month is 0.032% as compared to 0.015% at the beginning of the research and that is an increment of 113%, which supports the research hypothesis.



The content of silt has increased by 35% in the first month of application of waste water and it further went up to 43.5% in the second month but, came down slightly at the end of third month and again increased to 48% at the end of fourth month. The fraction of silt in at the end of fourth month of application of waste water is 0.034% as compared to 0.023% in the beginning of the research and that is an increment of 48% and the result supports the hypothesis of the research.

Figures 3.3: Showingthe changes in the constituents in the sand bed and Explanation

3.2 Data Interpretation

Interpretation of the results to draw conclusions about the impact of daily wastewater application on the properties of sand bed and its potential for desert reclamation have been presented as following:

A. **Nitrogen:** The initial concentration of Nitrogen (N) was a mere value of 0.001% in the total content of the sand sample tested in the lab. Within 4 months of daily application of waste water, the concentration became 0.183% and that is a huge rise of 18200%. Such a level of increase in first prime nutrient for plant growth is definitely a very positive sign for the reclamation of sand mass.

The following bar chart (**Figure 3.4**) shows the increment graphically:

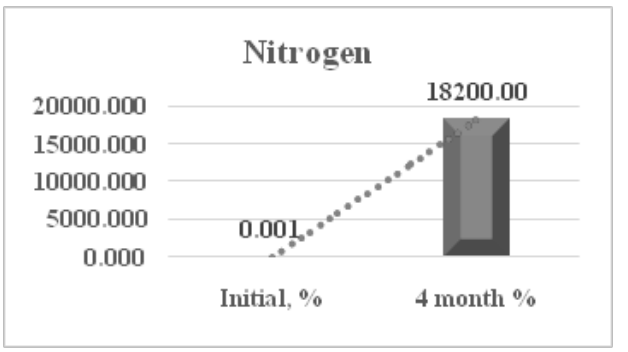
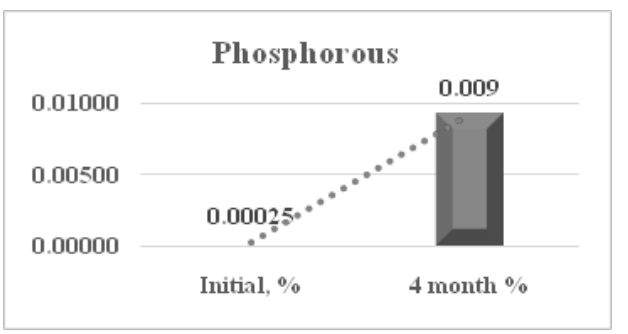


Figure 3.4: Showing comparison of initial and 4 months data of Nitrogen

B. **Phosphorous:** The initial concentration of Phosphorous (P) was only 0.00025% in the total content of the sand sample tested in the lab. Within 4 months of application of waste water daily the concentration became 0.009% and that is a huge rise of 3583%. Such a level of increase in second prime nutrient for plant growth is definitely a very positive sign for the reclamation of sand mass. The following **figure 3.5** shows the increment graphically:

Figure 3.5: Showing comparison of initial and 4 months data of Phosphorous



C. **Potassium:** The initial concentration of Potassium (K) was 0.45643% in the total content of the sand sample tested in the lab. Within 4 months of daily application of waste water, the concentration became 0.359% although it had risen to 0.509% at the end of third month. It is a fall of 21.42% and it could be because of prolonged monsoon diluting the waste water of Kathmandu.

The following **figure 3.6** shows the increment graphically:

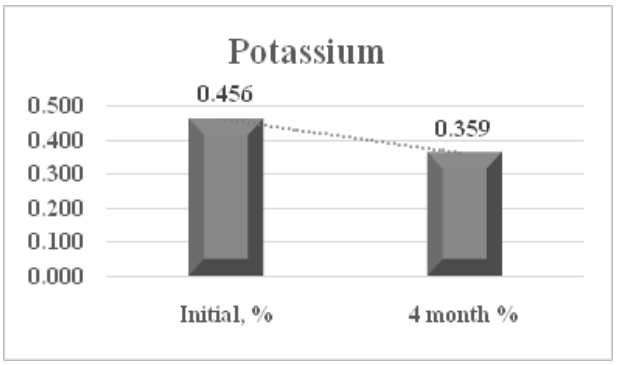


Figure 3.6: Showing comparison of initial and 4 months data of Potassium

D. **Organic Matter:** The initial concentration of organic matter was just 0.06% in the total content of the sand sample tested in the lab. Within 4 months of daily application of waste water, the concentration became 1.06%, a rise of 1667% although it had reached 1.42% in the third month and that was a rise of 2266.67%. Such a huge level of increase in organic matter is a very positive sign for the reclamation of sand mass as the cohesive property of the sand will increase and it will be able to hold the roots of plants. The following **figure 3.7** shows the increment graphically:

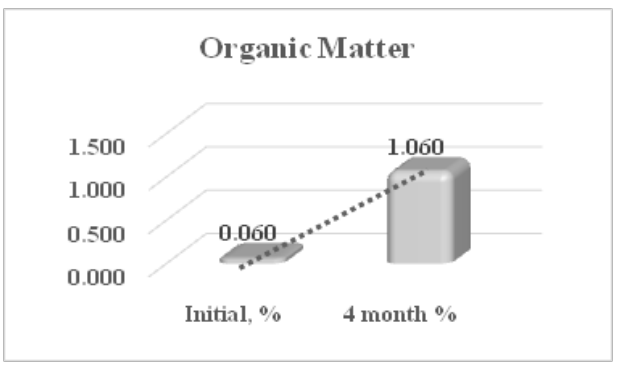


Figure 3.7: Showing comparison of initial and 4 months data of Organic Matter

D.1 **Result:** The equation obtained for the best fit curve of the bar- chart is;

y = 0.288x- 0.2242

Where; y is percentage of organic matter in the sand bed and x is number of months of application of waste water.

The minimum percentage of Organic matter for a sand to become a sandy soil is less than 0.5% as already mentioned. So, the organic matter content of the sand has risen from 0.006% to 0.6398% **in just 3 months** and in 4 months it has reached 0.9278% and it will keep on increasing with further addition of waste water daily. So, Organic matter is more than enough for reclamation of the sand bed.

E. **Total Organic Carbon:** The initial concentration of Total Organic Carbon (C) was only 0.035% in the total content of the sand sample tested in the lab. Within 4 months of daily application of waste water, the concentration became 0.61%, an increase of 1643%, although it was 0.82% at the end of 3 months and that was a rise of 2243%. Such a huge level of increase in organic carbon is a very positive sign for the reclamation of sand mass as the cohesive property of the sand and the health of the soil will increase and it will be able to hold the roots of plants.

Further, it will be able to harbor bacteria and earthworms and other biota that are essential for soil fertility and conversion of organic matters to inorganic forms. Such inorganic nutrients will be taken- up by plant roots for their growth. The following **figure 3.8** shows the increment graphically:

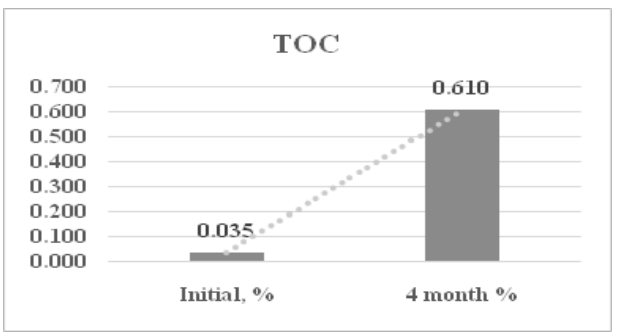


Figure 3.8: Showing comparison of initial and 4 months data of TOC

It is proportional to the fraction of Organic matter and it has followed the similar trend.

F. **Clay:** The initial concentration of Clay was only 0.015% in the total content of the sand sample tested in the lab. Within 4 months of daily application of waste water, the concentration became 0.032% and that is a rise of 113.33%. Such a level of increase in Clay content is a positive sign for the reclamation of sand mass as the cohesive as well as binding property of the sand will increase and it will be able to hold the roots of plants. The following Figure 3.9 shows the increment graphically:

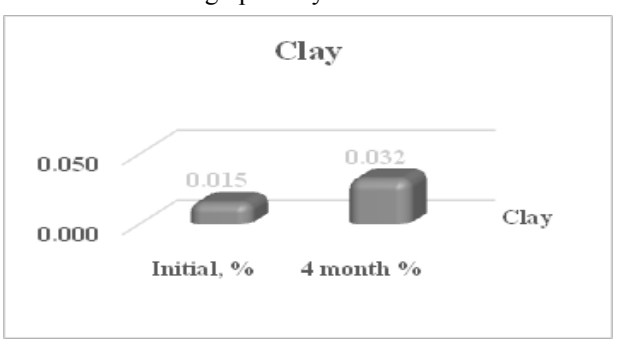


Figure 3.9: Showing comparison of initial and 4 months data of Clay

F.1 Result: The equation obtained for the best fit curve of the bar- chart is;

y= 0.0033x+0.0135

Where; y is percentage of clay in the sand bed and

x is number of months of application of waste water.

The minimum percentage of clay for a sand to become a sandy soil is less than 5% as already mentioned. So, the clay content of the sand has risen from 0.015% to 0.032% in 4 months and it will keep on increasing with further addition of waste water daily. Any number below 5% is good enough for the sand to become a sandy soil.

It will take 298 months of continuous application of waste water for the clay content to be 1% in the sandy soil. **An increase in flow rate, thus volume of daily application of waste water shall definitely shorten the time period for reclamation.**

G. **Silt:** The initial concentration of Silt was 0.023% in the total content of the sand sample tested in the lab. Within 4 months of daily application of waste water, the concentration became 0.034% and that is a rise of 47.83%. Such a level of increase in Silt content is a positive sign for the reclamation of sand mass as the cohesive as well as binding property of the sand will increase and it will be able to hold the roots of plants. The following Figure 3.10 shows the increment graphically:

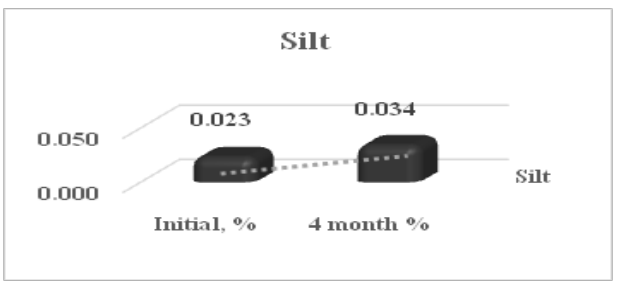


Figure 3.10: Showing comparison of initial and 3 months data of Silt

G.1 Result: The equation obtained for the best fit curve of the bar- chart is;

y = 0.0023 x + 0.0237

Where; y is percentage of clay in the sand bed and

x is number of months of application of waste water.

Anything above 1% of Silt in the sand is good enough for it to turn into sandy soil. A continuous application of waste water will keep on increasing the silt content of the sandy soil.

The current rate of application of waste water was just around 2 minutes a day. 424 months of continuous application is required to reach a concentration of 1% of silt with this rate of flow. So, an increased flow and thus, the volume of application of waste water will definitely bring down the time period of reclamation.

H.pH: The initial pH of the sand sample was 7.8 and it has been decreasing each month gradually to 7.2, 7.0, 6.9 and finally to 6.7 at the end of the fourth month. Neutral or slightly acidic soil is good for plant growth and thus, such decrease of pH is favorable for the hypothesis. The following figure 3.11 shows the Bar Chart of pH of all four months:

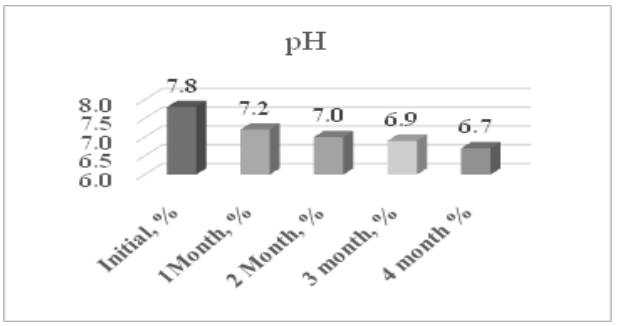


Figure 3.11: Gradual decrease of pH every month

3.3 Adjusting the Experiment (if needed)

- There was no need of adjustment in the experimental set up as the desired results were obtained.

3.4 Continuation and Long-Term Monitoring

- Daily application of wastewater was continued and data collected for over an extended period of 4 consecutive months to understand the trend of changes because of daily application of wastewater on the sand bed.
- The data obtained from the lab were regularly reviewed and analyzed to monitor changes and validate the conclusions of the study.

It was essential to maintain consistent and accurate data collection throughout the experiment to ensure the reliability of the study's findings. Additionally, adherence to ethical and environmental guidelines were also crucial to minimize potential negative impacts on the surrounding environment during the experimental process.

4. CONCLUSIONS AND RECOMMENDATIONS

3.1 Summary of the study's major findings

The results of the tests obtained in 120 days of continuous application of waste water in the test plot of sand bed has shown increase in all the parameters (Nitrogen-N, Phosphorous-P, Organic matter, Total Organic Carbon-TOC, clay and silt), except the potassium- K and pH that were measured. Decrease in pH is highly favorable for plants.

3.2 Contributions to the field of waste water treatment and desert reclamation

The result so far is very promising and it could have a great impact in reclamation of deserts in future.

3.3 Implications for future research and practical applications

Future research can be done in the desert itself and the results observed in this research shall be able to guide the field research.

3.4 Recommendations for policy and practice related to waste water management and desert reclamation

The countries that are located near or within deserts need to make a policy of utilizing vital resources present in the waste water and reclaim the deserts for beneficial purpose both to humans as well as the environment.

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A Comparative Study on Influencing Factors of Repurchase Intention in Internet Shopping Platforms in South Korea, China, and India: A Two-Stage SEM-Artificial Neural Network Analysis

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Abstract

In this study, we conducted a comparative study of Korea, China, and India on the influencing factors of internet shopping repurchase intention through SEM-ANN two-stage analysis, and analyzed changes in predictive performance and variable importance. As a result, through SEM analysis, it was confirmed that the factors influencing repurchase intention in internet shopping are different between Korea, China, and India. It has been proven that the R^2 of SEM is improved through ANN. And It has been proven that statistical-conclusion-validity was improved through which the size of the path coefficient in SEM remained similar to that of ANN's variable importance analysis.

Keywords*: SEM-Artificial Neural Network Two-Stage Analysis, Internet shopping repurchase*

Introduction

Currently, consumers are able to directly purchase products across international borders, establishing overseas internet purchasing as a standard consumer practice. For instance, in 2019, international consumers spent a total of $4.4 billion on South Korean internet shopping sites, with Chinese consumers alone contributing $3.8 billion, or 86% of the total sales (Jindan and Kwon, 2021). Furthermore, the expenditure by Chinese consumers on these platforms witnessed a significant surge, escalating from $234 million in 2014 to $4.4 billion in 2019, an increase exceeding sixteen times the amount spent five years earlier. This dramatic growth highlights the expanding scale and importance of cross-border e-commerce, particularly involving South Korean online marketplaces.

Until now, research into the global trend of direct internet purchasing has been somewhat constrained and typically biased towards specific areas of interest. For example, some studies have concentrated on South Korean consumers engaging with American or Japanese e-commerce giants such as Amazon and eBay (Lee and Rha, 2015; Jindan and Kwon, 2021). Conversely, there is a significant shortfall in scholarly attention given to Chinese or Japanese consumers who make purchases from South Korean online platforms. Likewise, there is a noticeable scarcity of research concerning Indian or Chinese customers buying from South Korean entities. This gap highlights a need for more comprehensive investigations into the buying patterns of these consumer groups within the context of South Korean e-commerce.

Given the marked rise in international online transactions, it is essential, from both academic and practical perspectives, to explore the factors that influence purchasing and repurchasing behaviours in e-commerce across different countries. This study investigates the key determinants of online shopping behaviours among consumers in South Korea, India, and China, recognising the significant influence these nations, particularly China and India, are projected to have on Korean commercial activities in both the near and long term. The research focuses on repurchase intentions on internet shopping platforms as the primary dependent variable, while considering Price, Quality, Service, and Information Search as independent variables. This approach allows for a detailed examination of the cross-national factors that affect repurchase intentions, offering insights into the diverse consumer dynamics in these significant markets.

In this study, a two-stage SEM-ANN analysis is adopted as the analytical method. These days, the field of Social Science and Management has integrated Deep Learning with SEM-ANN (Jiang and Kwon, 2023). This methodology capitalises on SEM's capacity for delineating causal relationships and ANN's predictive accuracy to exploit the advantages of Explainable Artificial Intelligence (XAI). Structural Equation Modelling (SEM)

focuses on relationships between variables based on linearity, while Artificial Neural Networks (ANN) utilise non-linearity to discern and model complex patterns (Kwon et al., 2024). The two-stage SEM-ANN approach merges SEM's linear aspects with ANN's non-linear capabilities to deepen understanding of causal relationships and enhance predictive efficacy. This research employed the two-stage SEM-ANN framework to examine how SEM's explanatory power (R^2) is augmented within ANN and to investigate changes in the impact of independent variables, informed by SEM's linearity, through ANN's non-linear analysis.

Research Model

Parasuraman et al. (1994) suggested a framework to assess consumer satisfaction through three critical dimensions: price, product quality, and service quality. Building on this foundation, Kim and Rhee (2004) highlighted these same factors as pivotal in influencing decisions for clothing purchases, while Bei and Chiao (2006) emphasized the importance of reasonable pricing, product quality, and service quality in fostering consumer satisfaction and loyalty. Drawing on these foundational studies and further research (Woo et al., 2023; Chen et al., 2018; Yunita et al., 2017), the current study examines price, quality, and service as essential determinants of repurchase intentions within online shopping environments. This approach seeks to deepen understanding of how these factors contribute to ongoing consumer engagement and loyalty on digital commerce platforms.

Internet e-commerce, conducted remotely, presents consumers with various uncertainties and risks throughout the shopping process. To mitigate these risks, consumers actively gather information about products, sellers, and delivery logistics, or seek out others' purchasing experiences for guidance (Hong and Jin, 2011; Liu and Noh, 2020). Those who are more sensitive to risk tend to engage more thoroughly in information seeking (Blodgett and Hill, 1991), and as perceived risks increase, consumers broaden their search across a more diverse array of information channels (Castle and Murray, 1991). This research focuses on non-face-to-face e-commerce environments and pinpoints these information-seeking behaviors as critical determinants shaping repurchase intentions. By understanding these behaviors, the study aims to enhance strategies for fostering consumer confidence and loyalty in online markets.

This research includes demographic and IT environmental variables to clearly delineate the impact of price, quality, service, and information search on repurchase intentions. It examined demographic variables such as gender, age, and expenditure on Internet shopping. Furthermore, the study evaluated IT environment variables, specifically Internet speed and associated costs, to assess their influence on consumer behaviour in online shopping contexts.

Research Methodologies

Analysis Methods

In the domain of Management Information Systems, the researches that integrate with Structural Equation Modelling (SEM) and Artificial Neural Networks (ANN) typically employs a method whereby PLS-SEM analysis results are inputted into ANN for additional scrutiny. This study similarly leveraged latent variable scores derived from SmartPLS as the input data for ANN analysis. The focus of the research was to undertake a detailed comparison of how the explanatory power, denoted by R^2, is enhanced between SEM and ANN outputs, and to examine the variations in the impact exerted by independent variables. This approach enables a thorough evaluation of the effectiveness of these combined methodologies, providing valuable insights into their applicability and precision in contemporary research.

In this research, the Artificial Neural Network (ANN) analysis was executed using the Multi-Layer Perceptron (MLP) feature from the Neural Networks module in SPSS. Consistent with prevailing practices in SEM-ANN studies, this analysis employed the standard settings provided by the MLP (Alharbi and Sohaib, 2021; Nguyen et al., 2021). This approach ensured a consistent framework for examining the models. The analysis began by feeding latent variable scores derived from Partial Least Squares (PLS) analysis into the MLP. After shuffling the data, training and validation datasets were distributed in a 9:1 ratio. This setup facilitated a rigorous ten-fold cross-validation process to thoroughly evaluate the model's robustness. Finally, this study compared the predictive (explanatory) performance of both PLS and ANN by calculating the coefficient of determination, R^2, thereby assessing their effectiveness in modelling complex relationships.

In PLS analysis, the coefficient of determination, R^2, serves as a critical measure to evaluate how effectively the independent variables can explain or predict the dependent variable. Here, the dependent variable is represented as y, and its predicted value is indicated as $\hat{y}$. The sum of squared errors (SSE) is calculated by taking the sum of the squared differences between y and $\hat{y}$. In contrast, the sum of squared deviations (SSD) is derived from the squared differences between the dependent variable y and its average value. The mean squared error (MSE) is then determined by dividing the SSE by the total number of samples, represented by 'n' in the associated mathematical expression.

SSE (sum of squared error) =

SSD (sum of squared deviation) =

MSE =

R^2 calculation is carried out as follows:

R^2 =

R^2 =

is variance. In SmartPLS, data is standardized and analyzed. Therefore, variance becomes 1, so, the formula is as follows.

$R^2 =$

$R^2 =$

Therefore, in SmartPLS, once R^2 is determined, it is possible to directly infer MSE.

Survey Questionnaire and Data Collection

The key variables in this research are price, quality, service, and information search. Price means that the price offered by an internet shopping mall is cheaper than that of an offline store or other internet shopping mall, or that the overall price including shipping costs is lower. quality means the superior nature of the products on offer, which may include cutting-edge trends or uniquely designed items. service means that deliveries are not only swift and secure but also that the process for returns and exchanges is efficient, supported by multiple communication channels for addressing customer queries. Information search means the activity of investigating product specifications and reading through consumer reviews online. Lastly, repurchase intention indicates the likelihood of customers returning to the website for future purchases or choosing to buy again.

The dataset employed in this study comprises 929 responses, gathered through an online survey conducted in 2019. This survey targeted individuals from Korea, China, and India, aiming to analyze factors that influence the repurchase of clothing on internet shopping platforms. The distribution of the responses is as follows: Korea 261, India 345, and China 323. Table 1 shows the key demographic and behavioral characteristics of the respondents.

Table 1 - Characteristics of Respondents

		Korea	China	India
Gender	Male	0.402	0.347	0.472
	Female	0.598	0.653	0.528
Age	Less than 20 years old	0.211	0.074	0.023
	Between 21~25 years old	0.318	0.341	0.093
	Between 26~30 years old	0.211	0.214	0.357
	Between 31~35 years old	0.100	0.232	0.328
	Between 36~40 years old	0.046	0.059	0.000
	More than 40 years old	0.115	0.080	0.200
Frequency of Purchase (Monthly)	1~2 times	0.487	0.288	0.765
	3~4 times	0.318	0.257	0.081
	5~6 times	0.096	0.198	0.067
	7~8 times	0.046	0.065	0.061
	More than 9 times	0.054	0.192	0.026

Data Analysis

Reliability and Validity

This study utilised data from 929 responses to validate the reliability and validity of its measurement model. SmartPLS software, a tool frequently used for PLS-SEM analysis, facilitated this process. The findings, as detailed in Table 2, demonstrate robust reliability; Average Variance Extracted (AVE) values exceeded 0.5, Composite Reliability (CR) surpassed 0.7, and Cronbach's alpha was above 0.6. Additionally, factor loadings for the constructs of the measurement items were consistently above 0.797, further affirming the model's reliability.

Table 2 - Reliability Test

	Cron-bach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Price	0.911	0.912	0.944	0.849
Quality	0.913	0.913	0.939	0.792
Service	0.833	0.834	0.899	0.749
Information Search	0.816	0.834	0.890	0.731
Repurchase Inten-tion	0.941	0.941	0.962	0.894

Following, the discriminant validity of the measurement model was analyzed, as detailed in Table 3. The analysis confirmed discriminant validity, indicated by the square roots of AVE for each construct exceeding the corresponding correlation coefficients among the constructs. This result validates that the constructs are distinct and measure different dimensions as intended.

Table 3 - Discriminant Validity

	1	2	3	4	5	6	7	8	9	10
1.Price	0.921									
2.Quality	0.663	0.89								
3.Service	0.706	0.712	0.865							
4.Information Search	0.668	0.709	0.691	0.855						
5.Gender	0.036	0.091	0.077	0.095	1					
6.Age	0.143	0.087	0.113	0.084	-0.057	1				
7.Internet Speed	0.512	0.527	0.562	0.546	-0.024	0.1	1			
8.Internet Cost	0.547	0.52	0.515	0.517	0.021	0.091	0.472	1		
9.Expenditure	0.193	0.314	0.271	0.28	0.136	0.062	0.238	0.173	1	
10.Repurchase Intention	0.666	0.748	0.756	0.687	0.106	0.063	0.565	0.462	0.353	0.946

SEM and ANN Analysis

In this study, the structural equation model was analyzed using SmartPLS, and the resulting latent variable scores were input into SPSS MLP as input data for analysis. Figure 1 is the result of analyzing Korean data using SmartPLS. Figure 2 is an ANN analysis model composed of two hidden layers. The first hidden layer consisted of 7 nodes, the second hidden layer consisted of 5 nodes, and the rest were set to the default SPSS MLP. In the ANN analysis, as in the SEM analysis, 90% of the total data was separated as training data and 10% as testing data, and 10 folds cross validation was performed.

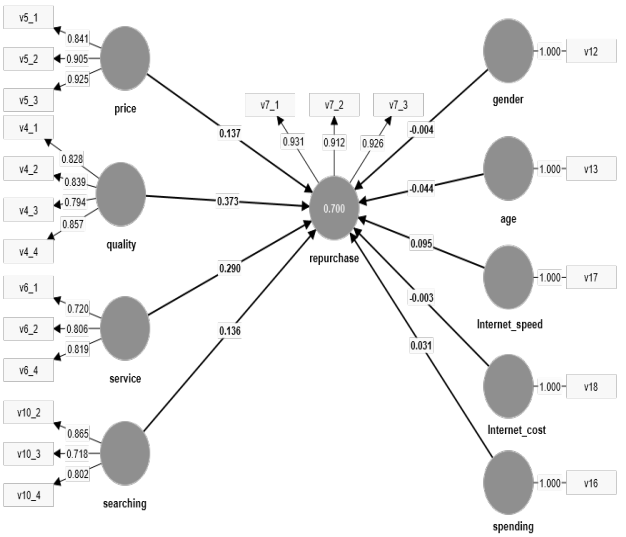

Figure 1 – Results of SEM Analysis by SmartPLS

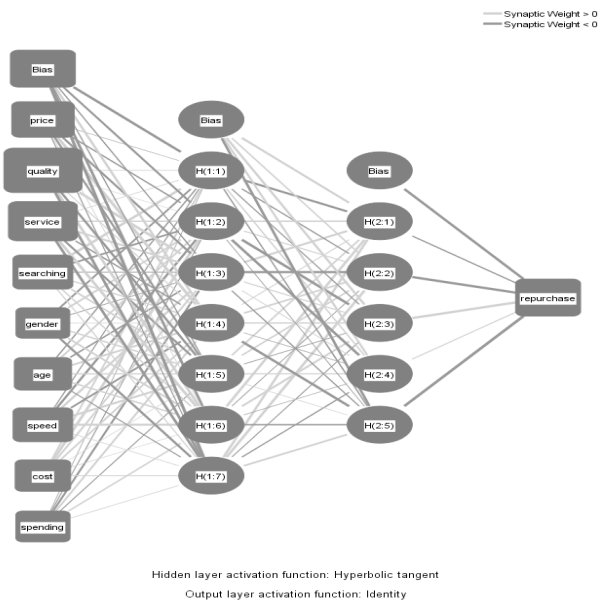

Figure 2 – Results of ANN Analysis by SPSS MLP

SEM Analysis Results

The outcomes of the comparative analysis investigating the impact of price, quality, service, and information search for repurchase intention in online shopping across South Korea, China, and India, while accounting for control variables, are summarized in Table 4.

The explanatory power of the independent variables on the dependent variable, measured by R^2, was highest in South Korea (70%) and India (70.3%), followed by China (49.9%).[1]This proved that the influencing factors on repurchase intention differ by country.

As a result of verifying the path coefficient at the 5% significance level, price, quality, service, and information search were all significant in Korea, price, quality, and service were significant in China, and service and information search were significant in India. It appeared significant. This proved that the influencing factors on repurchase intention differ by country.

As a result of examining the control variables at the 5% significance level, internet speed was significant in Korea, internet speed and age were significant in China, and gender was significant in India. As a result, it was confirmed that in Korea and China, the faster the internet speed, the higher the repurchase intention for internet shopping. In China, the younger the customer, the higher the repurchase intention, and in India, the female, the higher the repurchase intention.

Next, looking at the relative power of influence on repurchase intention up to 3rd place, Korea came in the order of quality, service, and price, China came in the order of service, quality, and price, and India came in the order of service, information search, Appeared in order of quality. As a result, it was confirmed that the influence of factors on repurchase intention also differs depending on the country.

ANN analysis results

The ANN analysis results are displayed in the ANN column of Table 4, which is the average of 10 folds cross validation. Detailed results of 10 folds cross validation are included in the appendix.

The difference between Train R^2 and Test R^2 in Korea, China, and India is not significant, so it is judged that there is no overfitting. When compared based on Test R^2, Korea and India were very similar at 72.4% and 72.1%, respectively, while China's was relatively low at 53.2%.

SPSS MLP presents the relative importance of independent variables to dependent variables through sensitivity analysis. Variable importance is interpreted similarly to the path coefficient of SEM. Sensitivity analysis is a method to check whether there is any difference in the R^2 or MSE of the model when one independent variable is removed from the original model or mixed randomly.

Looking at the three rankings of variable importance averaged through 10 folds cross validation, Korea was ranked in the order of quality, service, and price, China was ranked in the order of service, quality, and information search, and India was ranked in the order of service, information search, and price.

1 MSE (Mean Squared Error) of Korea, China, and India by SmartPLS analysis is 0.3, 0.501, and 0.297, respectively.

Table 4 - Comparison of SEM and ANN analysis results

		Korea		China		India	
		SEM	ANN	SEM	ANN	SEM	ANN
Variable Importance	Price	0.137**	0.139	0.113*	0.086	0.115	0.107
	Quality	0.373***	0.310	0.166***	0.174	0.118	0.094
	Service	0.290***	0.214	0.322***	0.264	0.455**	0.289
	Information search	0.136*	0.106	0.093	0.104	0.209*	0.176
	Gender	-0.004	0.024	0.011	0.030	0.085***	0.063
	Age	-0.044	0.037	-0.141***	0.058	0.051	0.055
	Internet speed	0.095*	0.083	0.166**	0.121	0.014	0.094
	Internet cost	-0.003	0.049	-0.082*	0.061	-0.036	0.065
	Expenditure	0.031	0.039	0.145**	0.103	0.033	0.056
R^2	Train_R^2	0.700	0.738	0.499	0.501	0.703	0.735
	Test_R^2		0.724		0.532		0.721

* 0.05 < p, ** 0.01 < p, *** 0.001 < p

Comparison of effect sizes of R^2

In the SEM model, the degree of change in R^2 is presented as the effect size (Hair et al., 2016). If the effect size is 0.35 or more, it is called a large effect, if it is between 0.15 and 0.35, it is called a moderate effect, and if it is between 0.02 and 0.15, it is called a small effect. When the R^2 of the research model is called and the R^2 due to changes in this research model is called , the effect size f^2 calculation formula is as follows.

When the latent variable values calculated as a result of PLS analysis were inputted and analyzed in the ANN model, the effect size f^2 was small at 0.087 in Korea, 0.071 in China, and 0.065 in India. Previous studies have shown that ANN has higher prediction performance than PLS (Sohaib et al., 2019; Duc et al., 2023). As a result of examining the degree of improvement in prediction performance in terms of f^2, the ANN analysis results showed a smaller effect size than the PLS analysis results.

Comparison of SEM's path coefficient and ANN's variable importance

The results of a comparative analysis of the path coefficient of SEM and variable importance of ANN are in Table 4. In subsequent studies, the name of the path coefficient and variable importance was expressed as variable importance.

The first and second places in variable importance for SEM and ANN were the same in Korea, China, and India. As a result, SEM's research results on the analysis of factors influencing repurchase were reconfirmed through ANN analysis. Therefore, the statistical conclusion validity of this study was proven to be more valid.

Next, some changes were found in variable importance. In the SEM analysis, China's 3rd and 4th places were price and information search, but in the ANN analysis, it changed to information search and price. In the SEM analysis, the variable importance of service, which ranked first in India, decreased from 0.455 to 0.289. It is believed that the importance of variables has increased as ANN's non-linear weights are reflected in the analysis process.

Conclusion: Implications and Limitations

In this study, the influencing factors of internet shopping repurchase intention were analyzed through SEM-ANN two-stage analysis, and changes in predictive performance and variable importance were identified. The conclusions and implications of this study are as follows.

First, through SEM analysis, it was verified that there are differences between countries in the factors influencing internet shopping repurchase intention. Therefore, in order for companies to effectively respond to the rapidly increasing trend of overseas Internet purchases, they need to understand these differences and establish management strategies based on them.

Second, the analysis performance was improved by inputting the SEM analysis results into ANN for further analysis. It is meaningful in that the degree of R^2 improvement resulting from the SEM-ANN second-stage analysis was analyzed according to Cohen's effect size, confirming that the results of the PLS analysis were improved by a small effect size through ANN. However, in this study, ANN model optimization was performed limitedly using a heuristic method while changing the SPSS MLP option. Therefore, the limitation is that we were unable to examine in depth the extent to which the effect size could be improved.

Third, changes in variable importance were compared in the second stage of SEM-ANN analysis. It is significant in that it increases statistical-conclusion-validity through generalization of variable influence by confirming that what is high in SEM is also high in ANN.

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<Table Appendix> 10 Folds Cross validation Results of ANN Analysis by SPSS MLP

Korea

ANN	price	quality	service	Search	gender	age	speed	cost	spending	TrainR^2	TestR^2
1	0.147	0.285	0.225	0.082	0.023	0.031	0.097	0.062	0.047	0.758	0.794
2	0.154	0.361	0.217	0.058	0.024	0.041	0.075	0.042	0.028	0.775	0.601
3	0.108	0.336	0.196	0.171	0.011	0.023	0.097	0.021	0.038	0.660	0.697
4	0.091	0.278	0.239	0.139	0.024	0.050	0.092	0.045	0.043	0.736	0.666
5	0.200	0.272	0.180	0.133	0.024	0.051	0.045	0.054	0.041	0.747	0.661
6	0.131	0.320	0.206	0.091	0.030	0.036	0.100	0.047	0.040	0.754	0.926
7	0.114	0.290	0.231	0.109	0.024	0.041	0.086	0.061	0.044	0.742	0.725
8	0.153	0.270	0.197	0.097	0.040	0.024	0.096	0.067	0.056	0.760	0.679
9	0.145	0.313	0.270	0.080	0.022	0.047	0.053	0.051	0.019	0.726	0.856
10	0.149	0.377	0.177	0.098	0.014	0.027	0.092	0.036	0.030	0.726	0.631
mean	0.139	0.310	0.214	0.106	0.024	0.037	0.083	0.049	0.039	0.738	0.724
std	0.029	0.036	0.027	0.032	0.008	0.010	0.019	0.013	0.010	0.030	0.098
SEM	0.137	0.373	0.290	0.136	-0.004	-0.044	0.095	-0.003	0.031	0.700	

China

ANN	price	quality	service	search	gender	age	speed	cost	spending	TrainR^2	TestR^2
1	0.080	0.148	0.247	0.116	0.016	0.061	0.112	0.092	0.127	0.404	0.541
2	0.074	0.189	0.258	0.093	0.036	0.054	0.139	0.066	0.090	0.530	0.435
3	0.077	0.169	0.274	0.120	0.023	0.051	0.119	0.055	0.112	0.507	0.455
4	0.102	0.169	0.317	0.066	0.040	0.066	0.140	0.022	0.079	0.510	0.648
5	0.098	0.197	0.244	0.103	0.027	0.037	0.133	0.032	0.129	0.525	0.515
6	0.116	0.160	0.273	0.120	0.018	0.065	0.084	0.070	0.094	0.514	0.530
7	0.064	0.189	0.314	0.108	0.038	0.083	0.073	0.065	0.068	0.491	0.494
8	0.079	0.198	0.250	0.144	0.022	0.052	0.123	0.044	0.088	0.524	0.439
9	0.091	0.158	0.254	0.088	0.040	0.060	0.122	0.064	0.123	0.520	0.585
10	0.083	0.161	0.210	0.082	0.036	0.050	0.162	0.094	0.122	0.482	0.678
mean	0.086	0.174	0.264	0.104	0.030	0.058	0.121	0.061	0.103	0.501	0.532
std	0.015	0.017	0.031	0.021	0.009	0.012	0.025	0.022	0.021	0.035	0.080
SEM	0.113	0.166	0.322	0.093	0.011	-0.141	0.166	-0.082	0.145	0.499	

India

ANN	price	quality	service	search	gender	age	speed	cost	spending	TrainR^2	TestR^2
1	0.100	0.122	0.203	0.181	0.099	0.059	0.114	0.061	0.062	0.847	0.678
2	0.072	0.120	0.388	0.113	0.031	0.086	0.076	0.071	0.044	0.720	0.668
3	0.061	0.050	0.124	0.323	0.056	0.053	0.094	0.082	0.156	0.579	0.620
4	0.051	0.143	0.361	0.166	0.074	0.091	0.045	0.022	0.048	0.712	0.593
5	0.187	0.053	0.302	0.122	0.064	0.054	0.098	0.078	0.042	0.742	0.776
6	0.068	0.120	0.276	0.207	0.095	0.044	0.120	0.033	0.037	0.803	0.824
7	0.094	0.125	0.370	0.104	0.053	0.052	0.069	0.079	0.053	0.737	0.754
8	0.171	0.066	0.361	0.216	0.025	0.049	0.037	0.039	0.037	0.681	0.783
9	0.144	0.082	0.290	0.155	0.051	0.028	0.133	0.076	0.041	0.702	0.657
10	0.125	0.060	0.219	0.169	0.082	0.039	0.154	0.108	0.045	0.827	0.858
mean	0.107	0.094	0.289	0.176	0.063	0.055	0.094	0.065	0.056	0.735	0.721
std	0.045	0.033	0.082	0.061	0.024	0.018	0.036	0.025	0.034	0.074	0.085
SEM	0.115	0.118	0.455	0.209	0.085	0.051	0.014	-0.036	0.033	0.703	

Relation Between Increasing Digital Technology and Customer Banking Services

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Abstract

As digital technology is developed and applied in the bank, customers' choices and interest in banking services increase. As a result, banks are becoming more digitally oriented to satisfy their customers' new preferences and demands. This study investigates how the banks' relationship with customers is affected by this digital focus. This study adopts a qualitative approach. The data gathered in the case study indicate that the relationship with customers has become less personalized and more automated. It also shows that an alignment in the bank has increased satisfaction among digitally oriented customers.

Keywords: *digital technology, banking services, customer choice*

Introduction

This introduction includes the background of digital technology, a statement of the problem of using digital technology in banks to increase customer satisfaction, objectives, and a review of some literature on digital technology.

Background

Digital means using electronic devices to generate, store, and process data in a format that uses discrete values, typically represented by zero and one. In a digital system, bit means the smallest unit and bytes imply a group of bits used to store numbers, letters, images, and sounds. The digital system stores numbers like 123, letters like abc, images like photo of Everest, and videos like long cinemasand transmits them by converting them into groups of 0 and 1 numbers(binary numbers). Modern computers understand, calculate, and transmit binary numbers.

Digital banking refers to digital features of banking sectors with the application of online banking and mobile banking. Online banking is the offering of banks to connect the websites of user's banks and make the transactions of deposits, transfers, withdrawals, and third-party cash payments. Mobile banking refers to the application of mobile to chequedeposits, fund transfers, any third-party payment, and depositor-to-depositor payment. The digital banking system has increased convenience, accessibility, and empowerment for banking customers by removing the need for physical presence at the bank.

Smartphone refers to a phone's ability to operate computerized features along with the traditional phone functions. Such features include the Internet, business applications, mobile payment, and multimedia functionality. Further facilities provided by such phones are cloud storage, cloud synchronization, and cloud assistance.

Banks' Digitalization lets customers integratedigital technology services to experience optimized banking functions and business analytics.

Objectives

The study aims to infer the bank's probable customer services due to the development of Digitalization in its overall operations.

Materials and method

The study bases the literature review on the Digitalization of banking operations and customer services.

Review of literature

Gargouri(2023) studied "Digital banking services: customers' pros and cons. theoretical literature "to give future users of digital banking services a clearer idea of the pros these services offer. The author explored some pros and cons of digital banking services. There were many: availability, mobility, time-saving, ease of access to services, autonomy in the relationship with the bank, reducing banking service prices and increasing interest rates on deposits, online bill payment, knowing about bank products, non-discrimination of technology, and environment friendly. Cons include the absence of human

contact, complexity, fear of insecurity, lack of internet connection, limited scope of services, unnecessary letters and notifications, and high usecosts [1].

Lolemoand Pandya(2024) researched "The impact of digital banking on customer satisfaction and loyalty in commercial banks: a systematic literature review." The study's objective was to examine the influence of digital banking on customer satisfaction and loyalty in commercial banks. The research applied a systematic literature review. The findings give insights for commercial banks to enhance their digital banking services to enhance customer satisfaction and loyalty [2].

BarjaktarovićRakočević, Spasenić, and Rakić (2024) discuss the students' perspectives on digital banking services.The research objective was to reveal student's perception of digital banking services in Serbia. They applied an empirical survey as an online questionnaire, with descriptive statistics applied. The results showed diverse patterns of digital banking engagement, with the most significant proportion of students specifying that they use DBS at least once per week. When they used banking services, they most often used them for money transfers and paying bills, emphasizing the vital role of digital platforms in facilitating financial transactions. Overall, students' satisfaction with DBS is ata high level, and students appreciate the technological development of banking offerings[3].

Mbatiah, John, Nyakeri, and Wilfred(2024) studied A Literature Review of the Effect of Digital Banking on the Performance of Commercial Banks in Kenya. The research objective was to establish the effect of mobile banking, internet banking, and electronics on the performance of commercial banks in Kenya. The researchers utilized a significant body of literature focusing on 15 articles concerning select aspects of digital banking on the financial performance of commercial banks. The persistent Growth of these technologies carries implications that extend beyond individual institutions, impacting the broader economy as well. This realization highlights the pressing need for a comprehensive investigation into the repercussions of mobile, online, and electronic banking on the overall economy.[4]

Csiszárik-Kocsir and Habil(2024) studied The Present and Future of Banking and New Financial Players in the Digital Space of the 21st Century, exploring how banking and financial players move in the digitalization surroundings. The study included 6804 evaluable responses and summarized responses. They administered the questionnaire online, ensuring the anonymity of respondents. [5]

Respondents were to judge many items that relate to banks' performances online and offline. The hypothesis tested wasH1.: Respondents with higher education are more open to financial innovation.H2.: Respondents who have studied finances earlier are more informed and opento new trends and actors in financial markets.H3.: A higher level of financial literacy tends to attract new financial actors to thedemand side of financial markets. [5] ANOVA was used to test the hypothesis. The study administered correlation among different groups.

Table 1: Costumers demand changing responses by banks

Author	Banks' address to changing demand
Naisbitt (1982)[11]	• Shift to information society • Shift to networking • Shift to decentralization
Naisbitt and Aburdene, (1990)[12]	• Shift to the booming global economy • Shift to free markets in socialist economies • Shift to Increasing similarities in global lifestyles • Shift to privatization of the welfare state • Shift to rise of women in leadership positions and roles • Shift to rise and progress of biotechnologies
Lee & Lee 2002, [23] Lee & al., 2007[13]	• Shift to competitive environment • Shift to low price and differentiated product • Shift to niche marketing • Shift to partnering
Aburdene, 2007[14]	• Shift to Increasing power of spirituality • Shift to spirituality in business • Shift to values-driven consumers • Shift to socially responsible investment pattern
TNS, 2008[15]	• Shift to group buying by consumers • Shift to social network shopping websites and group purchasing • Shift to sales and product info to mobile based on location • Biometric payment by fingerprints • Shift to shopping by mobile phone
Nurmi and Hietanen, 2008[16]	• Shift of Growth of Asian economy • Shift to sustainable growth concept • Shift of energy use in transportation
Pantzar, 2009[17]	• Shift to ICT-based services like 24-hour services, time-independent services, and home banking,
Singh & al, 2009[18]	• Shift to interconnection in digital media • Shift to integration of economies among BRIC countries [Brazil, Russia, India, China, South Africa, Iran, Egypt, Ethiopia, and the United Arab Emirates] • Shift to broad connectedness among banks to address multicultural customers at large
Deloitte, 2009[19]	• Shift to open information flows blogs, chats, web 2.0 • Shift to advanced devices providing sound and pictures in decision-making situations • Shift to increased trust in e-commerce and payment systems • Shift to a single Euro Payments Area (SEPA) • Shift to personal information use in purchasing • Shift to decline of traditional markets from 2015 onwards due to e-shopping and Growth of direct buying (estimated 20% market share by 2020) • Shift to Growth of mobile devices. • Shift to multiple channels used by consumers- -multichannel trade will grow to 30-40%of volume.

Ahola and Palkamo, 2009[20]	• Shift to scarcity as an innovation driver • Shift to new consumer movements impacts consumption • Shift to Global logistics will cut down costs and enable truly global retail • Shift to wireless technology enables time and place independent consumption
Ahvenainen & al. 2009[21]	• Shift to varying levels of population growth among industrialized and non-industrialized countries. • Shift to continuous technology development in" Moore law-type"dimensions[Moore's Law is a general observation that the number of transistors that make up integrated circuits doubles every two years] • Shift to Faster pace of changes with global reach. • Shift to Urbanization, e.g.,300 million people will be urban in China within the following decades;many developing nations expect the same pace. • The shift to a global economy has created a complex network of dependencies. • Shift to a Multi-polar world due to Growth of Asia • Shift to Globalization 3.0 – Growth of local production – blurred boundaries ofmanufacturing and logistics with global manufacturing corridors
Gracht and Darkow, 2010[22]	• Shift to companies' global networks and relationships become the enabler for competitiveness. • Shift to demand for convenience, promptness, and flexibility turn logistics into a success factor. • The shift of developing countries narrows the gap to industrial nations in many industrial sectors. • Shift to consumers demand convenience, simplicity, promptness, and flexibility. • The shift to knowledge expansion and the focus on knowledge generation, processing, and dissemination has led to the relocation of production activities and novel international division of labor. • Shift to biometric identification may become a standard identification technology.
Forrester, 2010[24]	• Shift to Next-generation business intelligence takes shape, combining real-time access with pervasiveness, agility, and self-service. • Shift to SaaS and cloud-based platforms become standard • Shift to Apps and business processes go mobile on powerful devices and faster networks • Shift to telepresence gains widespread use • Shift to Customer community platforms integrate with business apps • Shift to Apps and business processes go mobile on powerful devices and faster networks
Ovaskainen and Tinnilä, 2011[25]	• Shift to globalization and widening markets • Shift to integration of technologies and business processes • Shift to the evolution of business models • Shit to the increasing role of services and change in demand structures • Shift to need for multichannel solutions and channel management • Shift to the increasing role of cooperative networks and partnerships • Shift to structural changes in business • Shift to increasing knowledge-intensity

Tinnilä(2012) studied theimpact of future trends on banking services to explore the future trends of banks, applying an analysis of the literature produced by different authors from 1982 to 2012[6].

His work remained noteworthy for 1. Aging population pyramids, 2. 24/7/365 society, 3. Ubiquitous ICT services everywhere, 4. Empowered consumers, 5. Widespread e-commerce requires payment services, and 6— polarization of services.

Nurjanah, Shalshabilla, and Dari (2023) discuss the challenges and opportunities associated with digital transformation in the banking industry. They tried to see how digital transformation is in the banking industryin terms of the challenges and opportunities of this digital transformation. They applied literature research from several previous studies and found that digital transformation provides new opportunities for banking, and banking development has also increased due to this digitaltransformation. Employee empowerment attacks on cybertechnology arecommon [7].

Tran, Le, and Phan (2023) examine the digital transformation of the banking industry in developing countries to test the impact of digital transactions on banking performanceby applying a survey on 11 developing countries: Argentina, Brazil, Hungary, India,Mexico; Russia; Turkey; Indonesia; Malaysia; Thailand; Vietnam, from the data of 2012 to 2019 in the report of International Monetary Fund (IMF). They found that digital banks' flexible products andservices bring many benefits with a high level of interaction, such as supporting therelationship between customers and banks and improving operating revenue [8].

Hope (2020) discusses the future of retail banking and advocates for digital transformation in her work published by Temenos. The work tried to explore the different IT tools banks use and analyze the tools they will use in the future. The study found that Cloud/SaaS: APIs1, Microservices, DevOps, Big Data, I/Machine Learning, and Blockchain/Distributed DB are used massively [9].

KPMG (2019) explores the future of digital banking in their publication by the KPMG Network. It tried to forecast how the bank will look in 2030, applying analysis of past forecasts to forecastup to 2030. Their research reveals technology in 2030, customers in 2030, and banking in 2030 [10]

Conclusion

Banks must change their service patterns as technology changes in society. When customer movement is confined to local areas, the bank's responsibility is restricted to local areas only. When people started moving with the development of transportation and communication technologies, banks started their services accordingly. With the invention of ICT, the digitalization process appeared in the field of information and communication, and people demanded services from banks to get the verities of banking services quickly and conveniently.

The conclusion of the relationship between increasing digital technology and customer banking services is multifaceted: Enhanced Convenience, Improved Accessibility, Personalization and Customization, Cost Efficiency, Security and Trust, Rise of Fintech and Competition, and Digital Literacy and Inclusion. They also pose challenges related to security, privacy, and inclusivity. Banks must navigate these complexities effectively to harness the full potential of digital technology in delivering superior banking experiences to their customers.

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The Impact of Cross-platform Diversification: A Case Study on Food Delivery Sector in South Korea

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Extended Abstract

This study investigates the impact of cross-platform diversification by the leading e-commerce platform, Coupang, on the food delivery sector through its subsidiary brand, Coupang Eats. Despite facing challenges as a latecomer in platform competition, Coupang's robust market presence allows for the implementation of aggressive pricing strategies for Coupang Eats, resulting in significant effects on existing food delivery platforms.

This study employed a quasi-experimental approach using interrupted time-series analysis and relative time model. Through a case study, the literature sought to examine the effect of cross-platform diversification by the leader platform of the e-commerce sector, Coupang, on the food delivery sector. Specifically, the research aimed to uncover the impact of Coupang Eats' aggressive pricing strategy on the established leader platform in the food delivery sector, Baemin, as well as the follower platform within the same sector, Yogiyo. As an analyses results, H1a was consistently supported, but H1b and H2 were not supported. These results yield several intriguing findings.

Firstly, the aggressive pricing strategy implemented by Coupang Eats has been observed to negatively impact the usage time of the leader platform, but it did not exhibit a significant impact on the usage time of the follower platform. These findings present counterexamples to prevailing wisdom regarding platform strategies. According to conventional understanding, in a platform competition scenario where positive feedback mechanisms are at play, the aggressive strategy of a latecomer platform would be expected to have a stronger negative effect on the follower platform than on the leader platform. However, the unexpected finding here is that the impact of Coupang Eats' aggressive strategy is solely negative for the leader platform.

One plausible explanation for the observed findings is that within the existing competition between Baemin and Yogiyo, Yogiyo has employed more differentiation strategies compared to Baemin. Yogiyo, being at a disadvantage in terms of positive feedback, has implemented various discount events, such as brand discounts and Yogi-pass X. In this context, the cross-platform diversification of Coupang Eats may have influenced platform customers' interest in price competitiveness. As a result, while Baemin's customers, who were attracted to the platform based on positive feedback, might have left the platform, Yogiyo's customers, who were drawn to the platform primarily by differentiation strategies, may not have been more inclined to switch platforms.

Secondly, the impact of the shock is observed to occur with several weeks of time lag rather than immediately affecting the usage time of Coupang Eats and Baemin. This delay may be attributed to the time lag in information diffusion: it took time for customers to recognize the existence of Coupang Eats' aggressive pricing strategy following the shock (Yang & Leskovec, 2010).

This study suggests that leader platforms should develop their own competitive advantages beyond positive feedback advantages to withstand the impact of platform diversification. Additionally, the study advocates for cross-platform strategies to promote the long-term health of the platform ecosystem and prevent potential monopolization of platforms.

Frugal Innovation in Resource-Limited Settings: Leveraging Technology for Healthcare Advancements in Nepal

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Abstract

In resource-scarce contexts, overcoming limitations becomes a catalyst for innovation, driving the development of frugal approaches and resource optimization strategies. This paper uses a qualitative approach, drawing from various secondary sources, to investigate the potential of frugal innovation to address healthcare challenges in resource-limited settings, with a particular focus on Nepal. In countries like Nepal, access to essential healthcare services is often hindered by geographical constraints, poverty, and inadequate infrastructure. The paper explores how innovations, such as the Small-Incision Cataract Surgery (SICS) technique and the use of technologies like teleophthalmology, can be leveraged to bridge the gap between specialists and patients in remote regions of Nepal, demonstrating the effectiveness of frugal approaches in overcoming these limitations. This analysis also includes an exploration of the potential future and the challenges associated with implementing such innovations in Nepal. Furthermore, the paper highlights the crucial role that innovation plays in resource-constrained environments like Nepal. By leveraging innovation, such settings can overcome limitations by fostering the development of cost-effective solutions. The findings have the potential to inform strategies that improve access to quality healthcare services for underserved populations, not only in Nepal but also in developing countries globally.

Keywords: *Leaveraging, Constraints, Cataract, Surgery, teleophthalmology*

Digital Transformation, Entrepreneurship and Culture in Sardinia's Traditional Sector of Sheep and Goat Farming

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Extended abstract

The abstract presents the preliminary results of an ongoing research investigating from a multidisciplinary perspective on the relation between entrepreneurship, innovation and culture in the organization of sheep and goat farms in the island region of Sardinia (Italy). The research is part of the wider program APPàre (Smart and secure livestock farm applications to boost data-driven innovation), aimed at creating an app dedicated to collect and offer updated information and data both to farmers and players active in the field, supported by a large scheme of national and European funding for applied research (e.INS-PNRR). The research tools adopted by the multidisciplinary team of the University of Cagliari focusing on the analysis of the socio-economic context (including, besides the authors, other four units) comprises: a preliminary desk analysis; a short online questionnaire collecting farmers' opinion with reference to their perception of the most critical issues and the self-assessment of their digital skills; an ongoing field analysis including qualitative interviews exploring the manifest and latent demand for innovation, also through audiovisual documentation. The research methods adopted were intended to promote a climate of trust, dialogue and cooperation between the farmers and researchers involved in the project.

In Sardinia, that of sheep and goat farming represents a productive tradition strongly associated with the regional cultural identity, rooted both in the natural features of the territory and in the history of its socio-economic development. The relevance of this sector in the island region appears from its relative weight within the national context, where it accounts for almost half of the sheep sector and for just over a quarter of the goat sector in Italy. In absolute value, the total number of farms is 18,111, of which 76.31% represented by sheep farms and the remaining 23.69% by goat farms (data 2022). However, the number of flocks on each holding varies widely, from less than 50 to over 1000. On the supply side, the large part of the production deriving from Sardinian sheep and goat farming is directed to the dairy industry, which historically drove its expansion since the late nineteenth century, when entrepreneurs from the Lazio region set up dairies in Sardinia for the processing of the "pecorino romano" cheese, in great demand in American markets, of which today the island region represents the main producer. Besides its dependence from the dairy industry, Sardinian sheep and goat farming is also exposed to the risks associated to animals' health issues, due to infectious and parasitic diseases. Regional plans for prevention, control and vaccination have so far met with various resistance and critical issues, in particular linked to the low adherence of farmers to the protocols, as well as some inadequacies of the regional veterinary system. This may result in direct, disease-related and indirect losses for farms due to restrictions on the commercial movement of animals.

Empirical studies suggest that the defiance often opposed by Sardinian farmers to the requirements set by regional institutions for the various purposes (to enforce existing legislation, to prevent or manage health risks, to have access to EU funding), may be due to very different reasons: sometimes they may follow an instrumental logic aimed at avoiding the transition costs required to comply with the new rules and practices prescribed, but other times they may represent a form of cultural defense of traditional knowledge in face of the top-down application of aseptic "best practices" defined by expert knowledge. In general, it has been noted that defiance seems to be dictated not so much by a pre-emptive resistance to innovations in the sector, which are usually reckoned as necessary, but largely to farmers' claim to be agents of change, rather than merely executors.

Following this claim, part of our research focusses on the understanding of the contextual factors were farmers' activities are embedded, in order to identify those internal agents that may be identified as

possible drivers of a gradual cultural transformation leading farmers to adopt innovative entrepreneurial models, leading to innovative sustainable and integrated development.
The results of our desk analysis show a general picture of persistent backwardness of sheep and goat farming in Sardinia: production units are often small and territorially dispersed and show low propensity to cooperate or innovate. Those elements are confirmed from the analysis of nearly 100 questionnaires, also showing a significant presence of farmers with inadequate digital skills, possibly associated with low educational levels. Within this general picture, however, significant exceptions emerged, that were selected as case studies of innovative farming. The innovative farms studied so far (nearly 7) are characterized by their ability to integrate downstream farming activities with the direct processing of milk into differentiated dairy products and with the offer of services (also related to tourism or educational and cultural activities); for a propensity to work on the quality of these products and services rather than on quantity; for a capacity to use the opportunities offered by digitalization; for a focus on environmental sustainability and cultural and landscape protection; for a revaluation of the local dimension, not exclusively responding to a logic of monetary gain, but also of well-being and quality of life. The preliminary results of the field analysis show the relevance of some variables in the profile of the farmers who have defined the strategies at the origin of these «best practices», such as high levels of education, usually associated to young generations, not infrequently having had previous experiences outside Sardinia, and a new presence of female entrepreneurship.

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Measuring Entrepreneurial Legacy and Succession Strategy: Scale Development and Validation

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Abstract

Transgenerational entrepreneurship (TE) has shed light on how an enterprising family uses resources and capabilities to create entrepreneurial, financial, and socio-emotional value across generations. This study aims to develop and validate the scale of two legacy-related constructs: entrepreneurial legacy orientation (ELO) and succession strategy (SS). This study focuses on answering the question: how do ELO and SS impact next-generation members in enterprising families to engage in entrepreneurial actions? Drawing on family and entrepreneurial legacy literature, we developed reliable and valid ELO and SS scales and collected a multinational dataset from Taiwan, Thailand, Vietnam, Malaysia, and Indonesia to verify our new scales. Our sample of 417 observations confirms relationships between ELO, SS, and transgenerational entrepreneurial behavior. This study is essential and contributes to the family business studies and entrepreneurial literature by opening a quantitative way to investigate ELO and SS, which can serve as a foundation for future exploring transgenerational entrepreneurship phenomena.

Keywords: *Transgenerational entrepreneurship, Entrepreneurial legacy orientation, Succession strategy, Scale development.*

Introduction

Family firms engaging in entrepreneurial behavior are important actors in the social and economic realms worldwide. The entrepreneurial family is the "key site of capital accumulation in its different forms and transmission between the generations (Bourdieu, 1996, p.23)."Its unique features are proposed to influence the process and outcomes of entrepreneurship (Nordqvist & Melin, 2010). Accordingly, the research line of transgenerational entrepreneurship (TE) has emerged to shed light on how an enterprising family uses resources and capabilities to create cross-generational entrepreneurial value (Jaskiewicz, Combs & Rau, 2015; Clinton McAdam & Gamble, 2018; Barbera, Stamm & DeWitt, 2018; Pittino, Visintin & Lauto, 2018). Theoretical foundations for TE's more recent academic field are noticeably underdeveloped and lack cohesion (Habbershon et al., 2010). The inaction precludes our ability to understand fully and theorize entrepreneurial families' inclinations and how families' inherent entrepreneurial behaviors function across generations (Clinton et al., 2018)

The research domain of TE lies at the intersection of entrepreneurship and family business, which is still in its infancy. In both fields, the near disappearance of publications on theoretical perspectives associated with family-centered variables gives future research in TE opportunities. Contemporary research has focused on firm and individual levels TE issues such as family firm succession (Parker, 2016), TE family firm's business model (Clinton et al., 2018), the effects of corporate venturing on TE (Marchisio et al., 2010), and next-generation members' entrepreneurial entry decision (Pitino et al., 2018). However, except for some conceptual and exploratory research (Serrano et al., 2006; Jaskiewicz, et al., 2015; Barbera et al., 2018), there is still an absence of research devoted to distinguishing families in terms of entrepreneurial nurturing behavior as well as empirically validate the family's contribution to TE. In recognizing this gap, our study addresses how and why entrepreneurial behaviors manifest and develop across generations.

Although the distinctive aspect of family-influenced factors presents a rich opportunity for research, its multidimensional complexity and difficulty in assessment restricted current research. In this study, we focus on measuring entrepreneurial legacy orientation (ELO) and succession strategy (SS) to enable further investigation of how TE can be strategically motivated.

Literature Review and Hypotheses

TE refers to a family's mindset and capabilities to continue their entrepreneurial legacy of social and economic

wealth creation across generations (Serrano et al., 2006). Prior research in terms of family firm succession issues generally emphasized the governance structure of family firms in terms of ownership, the balance of power, and succession (Dyer, 2003; Naldi, Nordqvist, Sjöberg, & Wiklund, 2007; Stewart & Hitt, 2012), relatively less put their attentions on the social aspect of the enterprising family.

Legacy is how key elements of identity are projected and shared across generations. Recent legacy literature provides an initial insight into the family's attitude toward cross-generational entrepreneurship (Jaskiewicz et al., 2015; Barbera et al., 2018; Hammond et al., 2016; Rutherford & Kuratko, 2016). Some researchers have pointed out that family-related influences such as resources and capabilities (Sharma et al., 2014), traditions, and norms (Sharma et al., 2003) would enhance the successor's willingness. These studies recognized the critical role of entrepreneurial legacy and succession strategy in accomplishing TE.

Entrepreneurial Legacy Orientation

Entrepreneurial legacy refers to the family's rhetorical reconstruction of past entrepreneurial achievements or resilience (Jaskiewicz et al., 2015) and is a storytelling narrative shared over generations. Narratives about past resilience and entrepreneurial achievements give meaning to entrepreneurship by situating current risks about more substantial past challenges and linking family members to a rich history that defines who they are as a family (Barbera et al., 2018). Thus, a family with an entrepreneurial legacy imprints an entrepreneurial mindset onto the next generations, which binds the next generation's entrepreneurial spirit to their ancestor's entrepreneurial acts.

In this study, the scale of ELO measures a family's shared intentions and preferences toward entrepreneurship. In their pioneering case study, Jaskiewicz et al. (2015) proposed four dimensions of entrepreneurial legacy: entrepreneurial legacy awareness, family cohesion, family size, and childhood involvement in the family firm. More recently, another insightful case study by Barbera et al. (2018) indicated anticipated futures as a critical factor affecting the evolution of entrepreneurial legacy across generations. Based on their findings, we integrate the results from Jakiewicz et al. (2015) and Barbera et al. (2018) and construct ELO as a five-dimension variable.

The engagement of family firms in TE necessarily incorporates an entrepreneurial mindset across several generations. Such mindsets represent the attitudes and beliefs that infuse entrepreneurship into the family members across generations (Jaskiewicz et al., 2015). Entrepreneurial legacies are socially constructed through narrative and dramatic processes further imprinted in children through active involvement in the family firm and storytelling within large and cohesive families. Imprinted entrepreneurial legacies help motivate current and next-generation children's future entrepreneurship by either becoming a successor of family firms or creating new businesses. Therefore, based on the insights gained from existing literature, the instrument of enterprising families' entrepreneurial legacy, the ELO scale, is expected to influence TE positively. Thus, we propose:

Hypothesis 1: Entrepreneurial legacy orientation significantly positively impacts transgenerational entrepreneurship (regarding next-generation family members' willingness to take over & entrepreneurial intentions).

Succession strategy

Succession is the transfer of decision-making and ownership to the next generation. Research on family firm succession provides insights for TE. Most family firms cannot transition among generations because many family successions are poorly planned, implemented late, and plagued by conflict (Jakiewicz et al., 2015). The low rate of completed generational succession stresses the importance of improving our understanding of managing the succession process. In the succession literature, scholars have denoted that the succession process planning, the successor selection, and the successor's training and experience are critical factors in determining successful transgenerational transfer (Alayo et al., 2016). Le Breton-Miller et al. (2004) summarize the key characteristics of successful succession: a high-quality predecessor–successor relationship, strong successor motivation, relevant education and work experience for the successor, family harmony, and having a board of directors, a high-quality predecessor–successor relationship, strong successor motivation, relevant education and work experience for the successor, family harmony, and having a board of directors.

Succession strategy refers to an entrepreneurial family's strategic activities to nurture entrepreneurship, including strategic education, bridging, and transition. Venter et al. (2005) observed that if successors worked elsewhere before joining the family business, had a formal education, regularly attended business-related courses and seminars, and received mentoring from someone other than their parents, they would probably be more competent and ready to take over family firms. Purpose of strategic education, entrepreneurial families send their children to gain work experience from inside

and outside family firms (Jakiewicz et al., 2015), even create new corporate ventures (Marchisio et al., 2010), to train their children in managerial skills and ability of opportunity recognition. Entrepreneurial bridging refers to the transgenerational collaboration of at least two generations over several years to foster entrepreneurship (Jakiewicz et al., 2015). This is not just a period in which the young learn from the experience; the most critical is the older generation facilitates and encourages the younger generation's entrepreneurship. In addition, strategic transition mechanisms for preventing successors from paying out other family members are also essential. No buyouts ensure the successor pursues entrepreneurial opportunities without worrying about debt or family infighting (Jakiewicz et al., 2015). Based on the literature review, we summarize the results from Jakiewicz et al. (2015), Venter et al. (2005), and Marchisio et al. (2010) to construct SS as a three-dimensional variable.

In sum, families with an entrepreneurial legacy nudged their children toward educational and work experiences that were both high quality and related to the firm and its potential future opportunities. Children in legacy-oriented entrepreneurship families receive an entrepreneurial bridge that equips them with the resources and capacity to pursue entrepreneurial ideas. Families with an entrepreneurial legacy also implement the strategic transition of no buyouts to ensure the family's ongoing entrepreneurship. Overall, the orientation of entrepreneurial legacy enhances enterprising families' strategic succession activities that further help to nurture transgenerational entrepreneurship. Subsequently, we hypothesize the mediating role of succession strategy as follows:

Hypothesis 2: Succession strategy mediates the relationship between entrepreneurship legacy orientation and transgenerational entrepreneurship (regarding next-generation family members' willingness to take over & entrepreneurial intentions).

Methods

This study follows the widely accepted steps for scale development set forth by leading scholars (e. g., MacKenzie, Podsakoff, & Podsakoff, 2011; Rieg, & Kellermanns, 2015). Two studies contain our research, includes 1) scale development of ELO and SS and 2) empirical validation and hypotheses examination. Figure 1 shows the procedure of the present study.

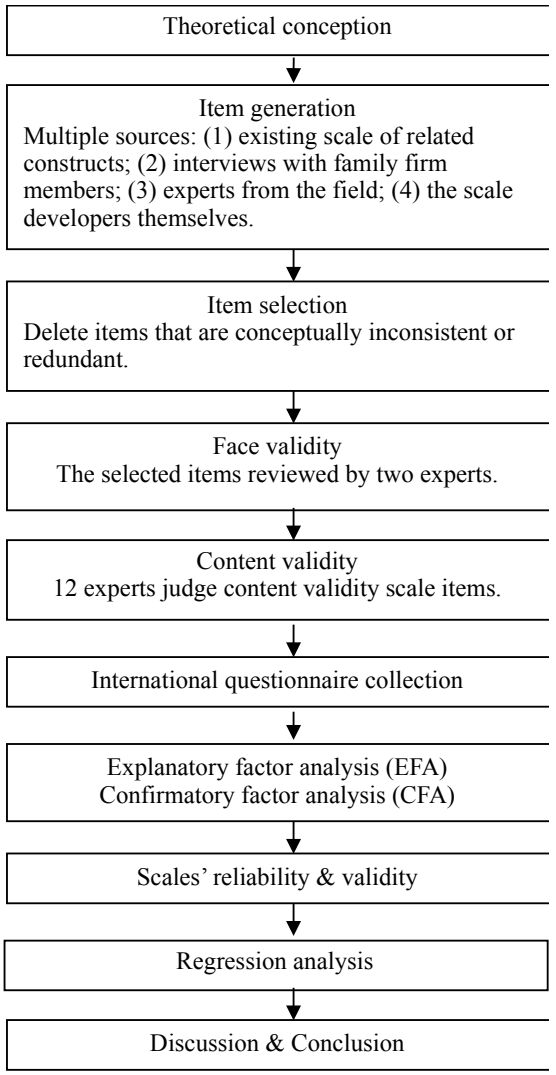

Figure 1 Research procedure.

Scale development.

The authors first do theoretical conception steps and item generation by literature review and small-scale interviews. Then, two academic experts are invited to check the face validity of the collected items. Next, to ensure content validity of scales development, we invite 12 doctoral-level experts to answer our questionnaire, including six academy researchers (the previous two researchers conducting the face validity are excluded) and six family business members with a Ph.D. degree or doctoral candidate.

Furthermore, a pre-test was carried out to access the content validity (MacKenzie et al, 2011). The pre-test sample consist of 91 valid responses that are collected from the students of Executive Master of Business Administration (EMBA) programs of three universities in Taiwan, our sampling target on the participants whose parent or grandparent are business owners. The result of the pre-test determines the items of ELO and SS that are subsequently used for the next step of multinational data collection.

Data Collection.

To determine the factor structure of the ELO and SS scales and validate the hypothesized relationships, we collected data from young generation members of business-owning families. We adopted the snowball sampling method due to the difficulties in reaching such a specific group. Data were collected across five nations: Taiwan, Indonesia, Thailand, Malaysia, and Vietnam. The authors contacted EMBA programs and local chambers of commerce in these countries to invite potential participants. In sum, our data were collected from three sources: (1) EMBA students in universities, (2) local chambers of commerce, and (3) friends or family members of participants from the aforementioned sources.

The survey was conducted in two waves using both in-person visits and online methods. The first wave involved sending questionnaires to 500 individuals in Taiwan, resulting in 308 valid returns. The second wave focused on nations outside Taiwan and utilized online questionnaires, yielding 163 valid returns. In total, the dataset comprises 471 valid questionnaires for further analysis. To check common method bias, we separate data collected in hardcopy questionnaires from online questionnaires and using t-test to test the differences between the two group of data. The results showed no significant difference between respondents' gender (p=0.056) and age (p=0.364) across the two sources.

Measurements.

Dependent variable, transgenerational entrepreneurship.

In this study, we refer to TE as the entrepreneurial family's next-generation members' intention to succeed or create a venture. Such behaviors are measured by using two proxies:

Willingness to Take Over (WTO), which assesses the respondent's intent to take over their family firm, measured by adopting five items from Venter et al. (2005).

Entrepreneurial intention (EI), which captures an individual's attitude and desirability toward venture creation and is measured by a four-item scale adopted from Esfandiar, Sharifi-Tehrani, Pratt & Altinay (2019).

Independent variables.

In this study, we developed two new scales, the ELO and SS. ELO evaluates a business-owning family's rhetorical reconstruction of past entrepreneurial achievements or resilience, using a newly developed scale. In addition, the variable SS measures the strategies a business-owning family uses to facilitate ongoing entrepreneurship in the family, is measured by our newly developed scale.

Control variables.

This study control for the individual- family- and family business-level variables. First, we include several individual characteristics to exploit their potential effects on next-generation family members' attitudes toward managing or creating business. Six individual-level variables include the respondent's *Age*, *Gender*, level of *Education*, *Nation*, *Family Firm Work Experience*, and *Entrepreneurial Experience*. In addition, two family-level control variables are included: the *Family Share Hold* by a respondent's family on family firm and the number of respondent's family members in the management position, the *Family Managers*. Moreover, the *Family Firm Size* is controlled.

Analysis and results

EFA and CFA

Firstly, an exploratory factor analysis (EFA) with principal axis factoring and varimax rotation was conducted to assess the factor structure of our data. Secondly, we run confirmatory factor analysis (CFA) with the SEM function in the STATA SE software to confirm the structure of scales. The dataset for ELO and SS passed the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. For the ELO scale, the initial EFA yielded a four-factor structure consistent with propositions in the literature (Jakiewicz et al., 2015; Barbera et al., 2018). However, academic expert suggested removing one dimension, family cohesion, as its concept did not align well with the concept of legacy. After CFA, we compare the goodness of fit of the two models then the model suggested by experts are selected, as shown in Table 1. In addition, for the SS scale, the EFA present an 8-items 3-factors structure, and the subsequent CFA confirm its model fit, as presented in Table 2. The final scale of ELO and SS are summarized in Table 3&4.

Table 1 Goodness of Fit of ELO Models

Model	Chi^2	df	Chi^2/df	CFI	TLI	SRMR	RMSEA
4-factors Model	71.65	29	2.470	0.984	0.975	0.022	0.056
*3-factors Model	21.291	11	1.935	0.993	0.987	0.017	0.045

Note: n=471; * the selected model; Acceptable model fit threshold: Chi-sqr/df<3; CFI&TLI>0.9; SRMR<0.05, RMSEA<0.08

Table 2 Goodness of Fit of SS Models

Model	Chi^2	df	Chi^2/df	CFI	TLI	SRMR	RMSEA
*3-factors Model	37.71	17	2.22	0.989	0.981	0.043	0.051

Note: n=471; * the selected model; Acceptable model fit threshold: Chi-sqr/df<3; CFI&TLI>0.9; SRMR<0.05, RMSEA<0.08

Table 3 Scale of Entrepreneurial Legacy Orientation.

Dimensions	No.	Items
Entrepreneurial Legacy Awareness (ELA)	Elo1	In my family, we have knowledge of how family survived past perilous times/ calamities.
	Elo2	In my family, we pride of past entrepreneurial behaviors of my family.
	Elo3	In my family, we knew the history of business establishing.

Childhood Involvement (CI)	Elo9	In my childhood, I worked after school or during vacation in the factory/store/ firm.
	Elo10	In my childhood, I regularly helped in the factory/ store/firm.
Future Anticipation (FA)	Elo11	In my family, we worked together for a better life of the family.
	Elo12	In my family, we hope to provide high-quality products to our customers.

Table 4 Scale of Succession Strategy.

Dimensions	No.	Items
Strategic Education (SE)	Ss2	I regularly attended business-related courses/seminars that prepared me to take over the family business.
	Ss3	I studied subjects relevant to family firm.
Entrepreneurial Bridging (EB)	Ss6	I get power from older generation manager to lead new projects in family firm.
	Ss7	Older generation manager accepts changes implemented by me in family firm.
	Ss8	I get resources from older generation manager to start projects in family firm.
Strategic Transition (ST)	Ss9	I don't have to buyouts of older generation manager at succession.
	Ss10	I don't have to buyouts of heirs at succession.
	Ss11	The older generation take good care with the transferring of control and ownership to successor.

Reliability and Validity

As shown in Table 5, reliability of the scales is assessed using Cronbach's alpha, all values are above 0.7, indicating high reliability. Convergent and discriminant validity is tested by calculating the average variance extracted (AVE) and the composite reliability (CR) measure (Fornell & Larcker, 1981; MacKenzie et al., 2011). The AVE and CR value of each dimension exceed the acceptable threshold.

Table 5 Reliability and Validity of scales

Dimensions	Alpha	Items	Factor Loading	AVE	CR
ELO (Cronbach's Alpha=0.820)					
ELA	0.803	elo1	0.72	0.584	0.807
		elo2	0.81		
		elo3	0.76		
CI	0.929	elo9	0.83	0.844	0.915
		elo10	1.00		
FA	0.720	elo11	0.85	0.586	0.736
		elo12	0.67		
SS (Cronbach's Alpha=0.832)					
SE	0.715	ss2	0.74	0.512	0.677
		ss3	0.69		
EB	0.904	ss6	0.88	0.763	0.906
		ss7	0.85		
		ss8	0.89		
ST	0.809	ss9	0.89	0.623	0.827
		ss10	0.86		
		ss11	0.58		

Note: Acceptable threshold: Cronbach's Alpha>0.7; AVE>0.5; CR>0.6

Result of regression analysis

Another objective of this study is to verify our new scales with multinational data. The 471 valid questionnaires are then used to estimate the hypothesized relationships by applying the hierarchical regression method. Table 6 exhibits the descriptive statistics and correlations of all variables for regression. The VIF values well within the acceptable upper bound of 10 (Hair et al., 2018). Thus, multicollinearity is not a concern in our study.

Table 7 presents results using Willingness to Take Over (WTO) and entrepreneurial intension (EI) as dependent variables. Model 1&4 are baseline models that include only control variables. In Model 2&5, the variable of ELO was added, and the result indicates that ELO has significantly positive effect on WTO (β=0.618, $p<0.001$ level) and EI (β=0.591, $p<0.001$ level). In addition, we test the impacts of ELO's three dimensions in Model 3 & 6, the result confirms the positive effects of ELA, CI and FA on the proxies of transgenerational entrepreneurship respectively, WTO and EI. Therefore, Hypothesis 1 is supported.

In Table 8 we test the mediating role of succession strategy. In model 8&10, we can see that SS have positive and significant effects on WTO (β=0.641, $p<0.001$ level) and EI (β=0.443, $p<0.001$ level). Then, in model 9 & 11, we put ELO and SS together into the models, the coefficients of ELO become weaker to WTO (β=0.618 in model 2 larger than β=0.320 in model 9) and EI (β=0.591 in model 5 larger than β=0.446 in model 11). The results indicate partial mediating effects exist. However, by applying Sobel test on the indirect effects, we found the indirect effects of ELO on WTO through SS is significant (z-value=9.896) while ELO on EI through SS is insignificant (z-value=1.341). Subsequently, hypothesis 2 is partially supported.

Discussion and conclusion

The purpose of this study is to investigate the influences of entrepreneurial legacy and succession strategy on the next generation family member's tendency to succession or create their own business. We first develop two scales, the ELO and SS, to measure the latent concept of family's entrepreneurial legacy and strategic activities to facilitate succession. After a pre-test and checking the scales' validity and reliability, we collect data using a questionnaire survey from enterprising families in five Asian countries. A total of 471 valid samples are used for final analysis. Our findings indicate that ELO positively impact transgenerational entrepreneurship, and SS mediate the relationship of ELO and the willingness to takeover of the entrepreneurial family's young generation children.

Entrepreneurial legacy is a family's mindset and attitude that can impact the entrepreneurial actions taken by the family as a group or the family's members as an

individual, motivating incumbent and next-generation owners to engage in succession strategies that foster TE. Although prior conceptual premises linked entrepreneurial legacy and succession strategy with transgenerational potential of entrepreneurship, these concepts remain fuzzy, and the relationship remains unable to test. Our scales thereby help fill the research gap of lacking empirical evidence of transgenerational entrepreneurship. By developing the ELO and SS scales, this study contributes to family firm and entrepreneurship literature by offering a quantitative way to investigate how family-level legacy tendency affects families' entrepreneurial behavior across generations.

Our work contributes to the literature of family firm in several ways. First, our newly developed scales, ELO and SS, could serve as essential tools of empirical validation on family-level legacy, which can further become a foundation to explore the complexity of transgenerational entrepreneurship. Second, echoing the calls of research on the under-represented areas of Asia (Sharma & Chua, 2013), this study collected data from enterprising families in Taiwan, Indonesia, Thailand, Malaysia, and Vietnam. Our findings are the first quantitative evidence regarding the relationships between entrepreneurial legacy and transgenerational entrepreneurship. This study then offers insightful knowledge on how entrepreneurial spirit passes across generations and subsequently contributes to aid entrepreneurial families and family-owned firms on the strategic actions toward succession. We believe our work makes a novel contribution to future exploration of the transgenerational entrepreneurship phenomenon.

Table 6 Descriptive Statistics and Correlations

Variables	Mean	S.D.	WTO	EI	1	2	3	4	5	6	7	8	9	10	VIF
Willingness to Take Over	5.19	1.10													
Entrepreneurial intension	5.31	1.24	0.41												
1. Age	5.33	5.87	-0.02	-0.02											1.05
2. Gender	0.66	0.48	0.12	0.03	-0.09										1.05
3. Education	3.17	0.68	0.05	0.06	0.01	-0.01									1.08
4. Nationality	1.88	1.43	0.10	0.13	-0.10	0.08	-0.01								1.13
5. Work Experience in Family Firm	3.73	7.61	-0.06	0.01	0.11	0.03	-0.19	-0.23							1.43
6. Entrepreneurial Experience	1.30	4.42	0.07	0.07	0.05	-0.02	-0.15	-0.11	0.46						1.30
7. Family Share Hold	3.05	1.11	-0.00	-0.00	-0.07	0.13	0.03	0.01	0.15	0.07					1.50
8. Family Managers	2.01	1.03	0.08	0.08	0.03	0.04	0.03	0.05	0.12	0.07	0.55				1.61
9. Family Firm size	2.32	1.37	0.02	0.02	0.03	0.06	0.13	0.17	-0.08	-0.06	0.08	0.25			1.14
10. ELO	5.30	0.87	0.50	0.42	-0.03	0.09	0.02	-0.03	-0.03	0.07	0.06	0.19	0.01		1.46
11. SS	4.98	0.98	0.57	0.36	0.06	0.00	0.09	-0.05	-0.01	0.03	0.08	0.13	-0.02	0.53	1.41

Note: Number of observations: 471; The corelation above 0.09 is significant at $p < .05$ or above level.

Table 7 Results of regression (Hypothesis 1)

Dependent variable:	Willingness to Take Over			Entrepreneurial Intension		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control Variables						
Age	-0.001 (.190)	0.002 (.007)	0.005 (.007)	-0.002 (.009)	0.000 (.008)	0.001 (.009)
Gender	0.289 (.048) **	0.171 (.093) +	0.188 (.092)	0.102 (.119)	-0.011 (.109)	-0.039 (.110)
Education	0.097 (.098) ***	0.076 (.066)	0.053 (.065)	0.176 (.084) *	0.165 (.078) *	0.138 (.078) +
Nation	0.060 (.063) +	0.081 (.032) **	0.099 (.033) **	0.133 (.041) **	0.166 (.040) ***	0.164 (040) ***
Family Firm Work Experience	-0.015 (.177) +	-0.006 (.006)	-0.005 (.007)	-0.003 (.008)	0.005 (.008)	0.007 (008)
Entrepreneurial Experience	0.034 (.013) **	0.021 (.011) +	0.018 (.011)	0.036 (.014) *	0.023 (.013) +	0.022 (.013) +
Family Share Hold	-0.084 (.055)	-0.054 (.048)	-0.049 (.047)	-0.072 (.061)	-0.034 (.056)	-0.036 (.056)
Family Managers	0.140 (.059) *	0.010 (.053)	-0.034 (.054)	0.194 (.067) **	0.068 (.063)	0.035 (.064)

Family Firm size	-0.030 (.038)		-0.009 (.033)			-0.041 (.034)			-0.124 (.043)	**	-0.106 (.040)	**	-0.136 (.040)	
Independent Variables														
Entrepreneurial Legacy Orientation			0.618 (.052)	***							0.591 (.061)	***		
Entrepreneurial Legacy Awareness						0.352 (.053)	***						0.260 (.063)	***
Childhood Involvement						0.077 (.024)	**						0.102 (.029)	***
Future Anticipation						0.221 (.050)	***						0.241 (.059)	***
Intercept			1.523 (.367)	***		1.215 (.367)	**				1.549(.0610)	***	1.583 (.432)	***
R square			0.28			0.31	**				0.22		0.22	
F-value			16.97	***		15.22					13.26	***	11.04	***

Number of Observations: 471; Standard errors are in parentheses; +p<0.10; * p < .05; ** p < .01; *** p < .001

Table 8 Results of regression (Hypothesis 2)

Dependent variable:	Succession Strategy	Willingness to Take Over	Willingness to Take Over	Entrepreneurial Intension	Entrepreneurial Intension
	Model 7	Model 8	Model 9	Model 10	Model 11
Control Variables					
Age	0.012 (.007) +	-0.006 (.007)	-0.003 (.007)	-0.006 (.009)	-0.002 (.009)
Gender	-0.088 (.082)	0.271 (.086) +	0.213 (.083)	0.090 (.111)	0.010 (.108)
Education	0.107 (.058) +	0.022 (.062)	0.032 (.059)	0.127 (.079) *	0.140 (.077) +
Nation	-0.012 (.030)	0.097 (.032) **	0.104 (.031) **	0.159 (.041) ***	0.169 (.040) ***
Family Firm Work Experience	0.001 (.006)	-0.010 (.006)	-0.007 (.006)	-0.000 (.008)	0.005 (.008)
Entrepreneurial Experience	-0.005 (.009)	0.029 (.001) +	0.022 (.010)	0.033 (.013) *	0.024 (.013) +
Family Share Hold	0.050 (.042)	-0.091 (.044)	-0.068 (.043)	-0.078 (.057)	-0.046 (.055)
Family Managers	0.005 (.047)	0.055 (.049)	-0.006 (.048)	0.135 (.064) *	0.067 (.062)
Family Firm size	-0.022 (.030)	-0.005 (.032)	-0.005 (.030)	-0.107 (.041) **	-0.100 (.039) *
Independent Variables					
Entrepreneurial Legacy Orientation	0.598 (.046) ***		0.320 (.054) ***		0.446 (.070) ***
Succession Strategy		0.641 (.042) ***	0.497 (.047) ***	0.443 (.054) ***	0.244 (.061) ***
Intercept	1.408 (.327) ***	1.793 (.306) ***	0.823 (.339) *	2.556 (.396) ***	1.206 (.436) ***
R square	0.29	0.37	0.42	0.18	0.25
F-value	19.03 ***	27.33 ***	29.74 **	10.42 ***	13.91 ***

Number of Observations: 471; Standard errors are in parentheses; +p<0.10; * p < .05; ** p < .01; *** p < .001

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Impact of Corporate Environment and Technological Characteristics on The Adoption and Use of Smart Factories by SMEs.

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Abstract

A smart factory is a manufacturing plant that any company operating in the manufacturing industry must adopt. This study aims to analyse the factors that determine the introduction of smart factories, which are the main contents of the Fourth Industrial Revolution, what kind of utilisation effects are occurring according to the level of introduction, and what efforts should be made to increase the utilisation effects.

Through prior research, this study derived factors such as technical characteristics, environmental factors, and IT technology experience as factors that led each company to introduce smart factories, and as a result, the contents of system introduction and facility introduction by introduction level were derived. In addition, it was found that companies strive to increase utilisation and improve effectiveness by conducting internal and external training. Based on these factors, a quantitative study was conducted. The results of the study are as follows.

First, environmental factors, technical characteristics, and IT technology experience were found to influence the adoption of smart factories. Among the environmental factors, external pressure was found to be influential, and companies with experience in IT technology were more likely to adopt smart factories. In addition, government support was found to be influential in the interviews in Study 1, but was not found to have a significant relationship in the quantitative study, and although it has an impact on the initial adoption of smart factories, it is not a significant factor for companies that want to improve the level of adoption by introducing smart factories.

Second, both system adoption and facility adoption were found to have a significant impact on the utilisation effect. In Study 1, companies responded that they operate smart factories by introducing facilities and systems together, and in Study 2, an influence relationship was derived that both system introduction and facility introduction have a significant impact on utilisation effect. However, the introduction of facilities does not affect the reduction of defect rate and satisfaction with use, so it is difficult to say that companies are applying and utilising smart factories by introducing facilities alone, and companies are significantly affected by the utilisation effects of introducing smart factories, such as reducing defect rate, improving delivery compliance rate, improving productivity, and satisfaction with use.

Third, training was found to be significant for all utilisation effects, but externally supported training was significant for all, and internal self-training was not significant. In Study 1, the interviewees mentioned that they did a lot of internal and external training and that it had an impact on utilisation, but in the quantitative study in Study 2, internal training had no impact and externally supported training had an impact. This shows that companies felt more effective in operating smart factories when they received external support training than when they conducted their own training, and that external support training is one of the factors that increase the effectiveness of companies' introduction and utilisation of smart factories.

In this study, we derived the factors necessary for the introduction of smart factories and examined the influence of each factor through Study 1 and Study 2. Through this study, we were able to find out what factors are necessary for domestic SMEs to introduce and operate smart factories, and furthermore, how to successfully utilise smart factories. This study will help companies that are considering introducing smart factories to explore ways to successfully build smart factories.

Keywords: *Environmental factors, technological characteristics, smart factory, management effect, utilization effects,*

Introduction

A smart factory is a manufacturing plant that is essential for companies operating in the manufacturing industry. With the introduction of smart factories, production sites are automated and operated with various ICT technologies, and it is considered to be a sector of the industry that benefits greatly from the development of ICT technology. While large enterprises have the technology and capital to introduce smart factories, SMEs lack capital, technology, and other constraints to introduce smart factories (Yerim Lee, 2019). Various environmental factors affect the adoption of smart factories by SMEs (Choi, Young-hwan & Choi, Choi, 2017). Since there is a lack of research on which environmental factors affect the adoption of smart factories by SMEs, this study aims to find out which environmental factors affect the adoption of smart factories by SMEs and how much.

In addition, it is expected that various technical characteristics of SMEs will have an impact on the adoption of smart factories by SMEs. However, there is a lack of research on the technical characteristics that cause SMEs to adopt smart factories, and we would like to find out which characteristics are influential and how much. This study aims to identify the technical characteristics and relationships that affect SMEs and provide guidelines for the adoption of smart factories (Yerim Lee, 2019).

There is still a lack of empirical research on the use of smart factories, and the reasons for this are education costs, security issues, construction costs, and lack of awareness of smart factories, and it can be said that these issues are causing realistic constraints on the construction and introduction of smart factories (Cho, Ik-Jun, 2021). Moreover, in line with the Fourth Industrial Revolution, Korea announced the 3.0 strategy in 2014, which is an innovation in manufacturing, and since then, it has been continuously promoting the spread of smart factories with the aim of enhancing national competitiveness and securing manufacturing competitiveness, but about 75% of the implementing companies are still in the basic stage of introducing the process, and even those that have introduced it are not able to utilise it regularly or continuously. This is a result of focusing only on quantitative diffusion led by the state in the short term, which may act as a hindrance in terms of securing the competitiveness of the domestic manufacturing industry (Sangil & Park, 2021).

Therefore, this study aims to derive factors for the adoption of smart factories, the level of adoption, and the effect of adoption based on previous studies, and to study the relationship between each factor by deriving a research model. Based on the quantitative research, we hope to provide guidance for SMEs to improve the level of adoption and maximise the utilisation effect, rather than staying at the level of adoption.

Research Background

Definition of Smart Factory

The definition of a smart factory varies across organisations and researchers, with Deloitte (2017) defining a smart factory as a connected operational and production system that continuously leverages the flow of data to respond to new demands and needs, and enables flexible production systems that are connected to production systems through automation.

Deploying smart factories for SMEs

The construction system based on the degree of utilization and capability of information and communication technology in smart factories is divided into five stages of smartization levels (no ICT, basic stage, intermediate stage 1, intermediate stage 2, and advanced stage), and the comprehensive smart capabilities of companies are measured, and the stages are divided into 'competence levels for manufacturing innovation (from level 1 to level 5)' to aim for gradual implementation according to the capacity and situation of smart factory companies, and to select and introduce appropriate levels and functions according to the internal situation of companies (Byung-chan Lee et al., 2021). The development stage is composed of five stages to help companies establish plans and make step-by-step improvements, and each stage is composed of a smart factory level, and the level is an indicator of the maturity of the smart factory, and is divided into five levels: no ICT, basic, medium 1, medium 2, and advanced.

Review of existing smart factory research

Previous research on smart factory adoption

When analysing the previous studies on the adoption of smart factories, Kim Hyun-gyu (2019) conducted an empirical analysis of ease of use and usability as factors that affect the intention to adopt smart factories. According to the study, both factors have a significant positive effect on the intention to adopt smart factories. In the case of Yerim Lee (2019), the factors affecting the intention to adopt a smart factory were defined and analysed as the level of understanding, construction and operation of a smart factory. As a result of the analysis, it was found that they have a significant impact on smart factory preparation.

Previous research on smart factory adoption levels

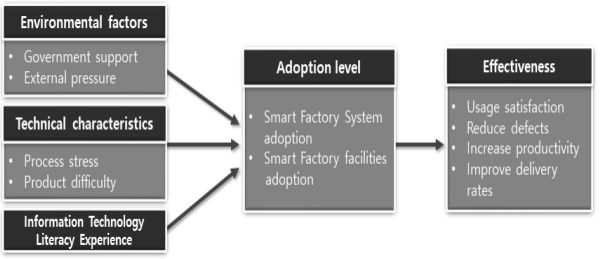
In the early days of the introduction of smart factories, policies for the quantitative distribution and spread of smart factories focused on small and medium-sized manufacturing companies were promoted, but policies for the qualitative level of advancement, such as the distribution of demand-tailored smart factories, support for R&D aimed at advancing smart manufacturing technology, and strengthening post-management, are in progress. In July 2020, a strategy for advancing manufacturing innovation based on artificial intelligence and data was established with the goal of the Korean version of the Digital New Deal, and the direction of policy is shifting to policies for qualitative advancement of smart manufacturing, and a policy to activate the 'My Manufacturing Data System based on the AI (Artificial Intelligence) Manufacturing Platform (KAMP)' early to spread the use of AI-centric manufacturing data has also been recently promoted. From 2023, the government plans to move from building intelligent smart factories centred on quantitative expansion to building intelligent smart factories centred on sophistication, and intelligent factories refer to the basic stage (digitisation of production information), middle stage 1 (real-time collection and analysis of production information), and middle stage 2 (real-time control of production information) (Smart Manufacturing Innovation Promotion Team, 2023).

Methods

Research Models

This study examines the relationship between smart factory adoption factors, adoption level, and adoption effect among companies that have adopted smart factories provided by the Small and Medium Technology Information Promotion Agency. Through prior research, two environmental factors, two technical characteristics, and one information technology utilisation experience were derived as factors for the introduction of smart factories, and the introduction level was derived as the introduction of smart factory systems and the introduction of smart factory facilities. As for the utilisation effect, four factors were derived: satisfaction of use, reduction of defect rate, improvement of productivity, and improvement of delivery rate.

Figure 1 Research Models



Research Hypothesis

The purpose of this study is to find out how environmental factors and technical characteristics affect the level of adoption of smart factories and how the level of adoption affects the utilization effect by analyzing the relationship between the factors and the level of adoption of companies that have adopted smart factories, and how the level of adoption affects the utilization effect of companies that want to adopt smart factories in the future.

Relationship between environmental factors and adoption levels

According to previous studies, government support, a sub-factor of environmental factors, has a positive effect on the intention to adopt and accept smart factories (Lee, Kwang-Cheol & Kim, Byung-Jo, 2022). Government financial support has a significant effect on the intention to adopt smart factories (Lee, Tae-Jin & Kim, Young-Jun, 2017). An empirical analysis of German manufacturers found that top management support, relative advantages, and high levels of competition in the industry have a positive impact on the adoption of the Fourth Industrial Revolution, while an uncertain external environment is the only factor that has a negative impact on the adoption of the Fourth Industrial Revolution. In addition, factors such as perceived challenges, company size, and absorptive capacity do not have a significant effect, and there is no difference between SMEs and large companies (Ko, 2021).

H1. Environmental factors will have a significant impact on the level of adoption.

H1-1. Government support will have a significant effect on the adoption of smart factory systems.

H1-2. Government support will have a significant effect on the adoption of smart factory facilities.

H1-3. External pressure will have a significant effect on smart factory system adoption.

H1-4. External pressure will have a significant effect on the adoption of smart factory facilities.

Relationship between technical characteristics and adoption levels

Based on previous studies, Lin et al. (2018) identified

factors for the successful implementation of smart manufacturing technologies in a study of strategic responses to prepare for the Fourth Industrial Revolution among automobile manufacturing plants in China. In order to identify the characteristics of the adoption process of innovative new technologies, the TOE framework was adopted, and IT maturity, technology incentives, perceived benefits, firm size and characteristics, external pressure and government policies were identified as factors, and the causal relationship between new technologies and utilisation was analysed. The study found that company characteristics and firm size did not increase the use of emerging manufacturing technologies. However, other factors had a positive impact on technology adoption among the firms surveyed. The relationship between technology adoption and firm characteristics such as size and ownership structure is not significant, but is significantly influenced by IT maturity and technology incentives. Based on the above discussion, the following hypotheses were developed.

H2. Technology characteristics will have a significant impact on adoption levels.

H2-1. Process stress will have a significant effect on the adoption of smart factory systems.

H2-2. Process stress will have a significant effect on the adoption of smart factory facilities.

H2-3. Product difficulty will have a significant effect on smart factory system adoption.

H2-4. Product difficulty will have a significant effect on the adoption of smart factory facilities.

Relationship between information technology experience and adoption levels

According to previous studies, the level of IT in a company has a significant impact on the intention to adopt smart factories (Lee, Taejin & Kim, Youngjun, 2017). CEO's intention, financial factors, ability to utilise information and communication technology, and expectation of government support have a positive effect on the intention to adopt smart factories (Kim, Sung-Tae, 2021). Based on the above discussion, the following hypotheses were established.

H3. Experience in utilising information technology will have a significant effect on the level of adoption.

H3-1. Information technology utilisation experience will have a significant effect on smart factory system adoption.

H3-2. Experience in using information technology will have a significant effect on the adoption of smart factory systems.

Relationship between adoption and effectiveness

Previous studies have shown that the level of smart factory adoption has a significant impact on manufacturing capabilities (Jinhan Kim et al., 2019). By implementing facility automation and task automation in smart factories, companies can realise automation of manufacturing instructions, scheduling, defect rate management, quality management, and performance processing by factory, and achieve the purpose of improving productivity in production and supply chain (Shin, Chul, 2017; Lim, Jungwoo, 2017; Wu et al., 2016; Waibel et al., 2017). In smart factories, automation of facilities and tasks is said to provide competitive advantages such as increased production capacity, cost reduction, quick response to new product development, reduced defect rate and improved product quality, production of customer-specific products, automation of production schedule management on site, and securing work safety (Choi, 2017). Based on the above discussion, the following hypotheses were established.

H4. The level of adoption will have a significant effect on the utilisation effect.

H4-1. Smart factory system adoption will have a significant effect on usage satisfaction.

H4-2. Smart factory system adoption will have a significant effect on defect rate reduction.

H4-3. Smart factory system adoption will have a significant effect on productivity improvement.

H4-4. Smart factory system adoption will have a significant impact on delivery rate improvement.

H4-5. Adoption of smart factory facilities will have a significant effect on usage satisfaction.

H4-6. Adoption of smart factory facilities will have a significant effect on reducing defect rate.

H4-7. Adoption of smart factory facilities will have a significant effect on productivity improvement.

H4-8. Adopting smart factory facilities will have a significant effect on improving delivery time.

Define the operational definitions for each variable

In this study, the variables as shown in the research model in Figure 1 were defined as operational definitions for each concept based on previous studies, and the questionnaire items were modified and supplemented to suit the purpose of the study. All measures of the research variables were measured using a 5-point Likert scale. Among the environmental factors, government support is defined as the level and effectiveness of the government's institutional support for the diffusion of smart factories (Kuan & Chau, 2001; Lin, 2014). Among the environmental factors, external pressure is defined as the degree of influence from competitors in the same industry (Thong, 1999 ; Oliveira & Martins, 2011; Ko, Kyungseok et al., 2021). Among the technical characteristics, process stress is defined as a factor that includes technical stress in the production process, manufacturing systems and ancillary environments that require the attention of the site and workers during production (Jung, 2002; Cho, 2017; Lin et al., 2018), and product difficulty is defined as a factor that includes difficulty in product specifications,

technical expectations, material completeness of the product, number of process procedures, and number of parts (McCarthy, 1981; Ungan, 2005; Yongbin Lim, 2006; Chan & Chong, 2013). At the adoption level, smart factory system adoption is defined as a system that is applied to the actual factory operation to support various decisions (Rashid et al, 2002; Kim Hanju et al., 2019; Lee Rok & Kim Chae Soo, 2020), and smart factory facility adoption is the lowest level hardware system and is a system that transmits physical and environmental conditions such as energy, environment, sound, and operation location to the platform through sensor and network technology (Davis & Edgar, 2009; Lee Rok & Kim Chae Soo, 2020; Lee Jeong-Ryeon & Lee Chang-Won, 2021). In utilisation effectiveness, usage satisfaction was defined as an emotional and cognitive state in which users feel that they are adequately performing according to the cost and effort invested to introduce a smart factory (Oliver, 1980; Venkatesh et al, 2011; Sangil & Park, 2021), and defect rate reduction was defined as a factor that is expected to have various effects such as reducing the cost of defects, reducing the rate of material defects, improving defect detection performance, and reducing the rate of defects during production by introducing a smart factory and utilising a smart factory (Deloitte, 2017; Choi & Choi, 2017) Productivity improvement is a factor that is expected to have various effects such as quality improvement, elimination of process and raw material waste, cost reduction, delivery time improvement, and energy saving by introducing smart factories and utilising smart factories (Choi, 2017; Ramakrishna et al. , 2017; Oh, Joo-Hwan et al., 2019), and delivery rate improvement is defined as a factor that is expected to have various effects such as reducing the number of delivery standards, lead time, improving customer response speed, and shortening delivery dates by introducing smart factories and utilising smart factories (Lee, Hansup & Kang, Seung-Kye, 2001; Lee, Jong-Keun, 2023).

Analysis

Selection and statistical characteristics of the sample

We collected information on companies with excellent implementation cases provided by the Smart Manufacturing Innovation Promotion Division of the Korea Small and Medium Business Technology Information Agency. Through the information disclosure portal, we requested the Korea Small and Medium Technology Information Agency to disclose information on companies that have introduced smart factories, and the agency disclosed the names of 30,000 companies that have introduced smart factories. Based on this information, we requested an online survey from companies that have introduced smart factories. A total of 215 questionnaires were received from 2 June 2023 to 22 July 2023. After excluding insincere responses, a total of 204 surveys were analysed.

Statistical characteristics of the sample

The sample characteristics of the respondents in this study consisted of job title, work experience, sales, cumulative period of using smart factories, number of employees, industry, defect rate reduction, delivery rate improvement, and productivity improvement, and the final number of respondents was 215. The number of respondents was 204 after excluding the non-respondents. The most common job titles were deputy general manager, 55 (27.0%) general manager, and 50 (24.5%) general manager; the most common work experience was 10 years or more 89 (43.6%), 5 years or more 10 years or less 50 (24.5%), and the most common turnover was less than 5 billion 79 (38.7%), and 10 billion to 50 billion 52 (25.5%). 64 (31.4%) have been in business for less than 6 months, and 38 (18.6%) have been in business for more than 4 years. The number of employees was 77 (37.7%) with less than 20 employees, and the industry was 89 (43.6%) with machinery and metal. The highest number of defect rate reductions was 106 (52.0%) from 0% to 5%, while delivery rate improvements were 84 (41.2%) from 0% to 5% and 66 (32.4%) from 5% to 10%. Productivity improvements were 76 (37.3%) from 0% to 5%, 70 (34.3%) from 5% to 10%, 30 (14.7%) from 10% to 20%, 15 (7.4%) from 30% and 13 (6.4%) from 20% to 30%. The results of the demographic analysis are shown in Table 1 below.

Exploratory factor analysis and reliability analysis

Exploratory factor analysis and reliability analysis of environmental factors, technological characteristics, and information technology utilization experience

A total of five factors were derived, categorized as process stress, external pressure, information technology experience, government support, and product difficulty, with a total cumulative explanatory power of 78.706%. KMO is 0.730 and Bartlett's test is χ^2=1652.265, which is a significant model ($p<0.05$). Process stress was found to have an eigenvalue of 3.006 and an explanatory power of 20.037%. Some of the process stress variables were removed because their factor loadings did not meet the threshold of 0.6. External pressure had an eigenvalue of 2.459 and an explanatory power of 16.104%. Information Technology Experience had an Eigenvalue of 2.416 and an explanatory power of 15.897%. Government support has an eigenvalue of 2.359 and an explanatory power of 15.726%. Product difficulty has an eigenvalue of 1.567 and an explanatory power of 10.447%.

The Cronbach's α coefficient for the reliability analysis of the four items of Process Stress is 0.887, which is higher than the universal standard of 0.6. Therefore, the reliability of most responses is acceptable. The Cronbach's α coefficient for the three external pressure items is 0.882. This indicates an acceptable level of reliability. The Cronbach's α coefficient for the three items of experience in utilizing information technology is 0.867. This indicates an adequate level of reliability. The Cronbach's

α coefficient for the three items of government support was 0.852. This is also an acceptable reliability value. The Cronbach's α coefficient for the two items on product difficulty was 0.717. Most of the items showed a value of 0.6 or more, indicating a good level of reliability, and all of the derived items showed an appropriate level of reliability, which is the internal consistency of the overall response. The results are shown in Table 2.

Adoption level exploratory factor analysis and reliability analysis

A total of two factors were derived from the factor analysis of smart factory facility adoption and smart factory system adoption, and the total cumulative explanatory power was 76.751%. KMO is 0.841 and Bartlett's test is χ^2=896.088, which is a significant model ($p<0.05$). Adoption of smart factory facilities was found to have an eigenvalue of 2.849 and an explanatory power of 40.701%. Adoption of smart factory system was found to have an eigenvalue of 2.523, with an explanatory power of 36.050%. Items whose factor loadings on individual factors did not exceed the threshold of 0.6 were excluded.

Cronbach's α coefficient was 0.872 for the reliability analysis of the three items of smart factory system adoption. Cronbach's α coefficient was 0.881 for the reliability analysis of the four items on the introduction of smart factory facilities. Most of the items showed a value of 0.6 or more, indicating a good level of reliability, and all of the derived items showed an adequate level of reliability, which is the internal consistency of the overall response. The results are shown in Table 3.

Exploratory factor analysis and reliability analysis of utilization effects

As a result of the factor analysis, a total of four factors were derived: defect rate reduction, usage satisfaction, delivery rate improvement, and productivity improvement, and the total cumulative explanatory power was 83.411%. KMO is 0.952 and Bartlett's test is χ^2=4930.738, which is a significant model ($p<0.05$). The eigenvalue of defect reduction is 4.914, and the explanatory power is 24.568%. Satisfaction with use has an eigenvalue of 4.725 and an explanatory power of 23.626%. Improvement in Delivery Rate has an eigenvalue of 3.689 and an explanatory power of 18.443%. Productivity Improvement has an eigenvalue of 3.355 and an explanatory power of 16.773%. We excluded items whose factor loadings on individual factors did not meet the threshold of 0.6.

Cronbach's α coefficient was 0.954 for the six defect reduction items. Cronbach's α coefficient was 0.955 in the reliability analysis of 6 items for satisfaction of use. Cronbach's α coefficient was 0.954 for the 4 items on delivery time improvement. The Cronbach's α coefficient for the four productivity improvement items was 0.925. Most of the items showed a value of 0.6 or more, indicating a good level of reliability, and all of the derived items showed an adequate level of reliability, which is the internal consistency of the overall response. The results are shown in Table 4.

Confirmatory factor analysis

Discriminant validity analysis and results

Focused Letter Analysis Results

The observed variables that comprise the latent variables all showed a significant positive relationship ($p<0.05$), with a standardized coefficient of at least 0.714 and a squared multiple correlation (SMC) of at least 0.298, most of which were above 0.7. However, product difficulty1 was found to be somewhat below the standard. However, the AVE and CR values were above the threshold, so we included them in the analysis. In addition, the AVE, which means the validity of the observed variables comprising each latent variable, was at least 0.528, which is above the appropriate value of 0.5, and the CR value, which means the reliability, was at least 0.758, which was higher than 0.7, indicating that the variables comprising the latent variables were appropriate. The C.R. (Critical Ration) value of the non-standardized λ that needs to be checked for validation is 1.96 or higher at the $p<.05$ level. Therefore, the intensive validity was verified according to the following criteria. In this study, Composite Reliability (CR) is above the threshold of 0.7 and Average Variance Extracted (AVE) is above the threshold of 0.5, so it can be evaluated that the convergent validity of the research variables is secured. The standardization coefficient is more than 0.5, and there is no concern of multicollinearity in SMC (Squared Multiple Correlation), and it seems to be appropriate to construct latent variables. The details are shown in Table 5.

Discriminant validity analysis results

In this study, we calculated the correlation coefficient between variables and compared it to the square root of the average variance extracted (AVE) on the diagonal to determine discriminant validity.

The observed variables comprising the latent variables are identified for their concentration and discriminant validity with other latent variables. The intensive validity of the latent variable is based on the AVE value of 0.5 or more, and the discriminative validity is checked by calculating the squared value of the correlation coefficient with another latent variable. The AVE value should be greater than the square value of the correlation coefficient, and it is generally judged that discriminatory power is secured when the square value of the correlation coefficient is 0.4 or less. As a result of the analysis, the minimum value of AVE was 0.528 and the maximum value was 0.818, and the discriminant validity of the square value of the correlation coefficient with other variables was lower than the AVE value in most cases.

Therefore, it can be said that the discriminant validity between the variables is secured. The following Table 6 shows the results of the discriminant validity analysis.

Results of a cross-variable influence analysis

For the empirical verification of the hypotheses established in this study, a path analysis based on the structural equation model was conducted, and the results of the hypothesis verification were analyzed by path to interpret the results.

The independent variables external pressure (β=0.202, p<.01) and information technology utilization experience (β=0.701, p<.001) have a significant impact on the adoption of smart factory systems. External pressure (β=0.261, p<.001), experience in utilizing information technology (β=0.493, p<.001), and product difficulty (β=0.134, p<0.05) have a significant effect on facility adoption.

The impact analysis of the four influencing factors on the dependent variable, utilization effect, is shown below.

The introduction of smart factory systems (β=0.411, p<.001) and smart factory facilities (β=0.306, p<.001) have a significant impact on improving delivery rates, and the introduction of smart factory systems (β=0.340, p<.001) and smart factory facilities (β=0.339, p<.001) have a significant impact on improving productivity. The introduction of smart factory system (β=0.472, p<.001) and smart factory facility (β=0.228, p<.01) have a significant impact on reducing defect rate, and the introduction of smart factory system (β=0.447, p<.001) and smart factory facility (β=0.273, p<.001) have a significant impact on user satisfaction. The analysis is shown in Table 7 below.

Conclusion

Research Summary

In this study, we constructed each research model with reference to previous studies and analyzed the influence relationship according to the research model. This study was conducted by requesting questionnaires online from companies selected as excellent construction cases and companies introducing smart factories provided by the Smart Manufacturing Innovation Promotion Division of the Small and Medium Business Technology Information Agency, and received 215 copies, and analyzed based on a total of 204 copies, excluding insincere responses.

Among the environmental factors, external pressure was found to have a significant impact on the adoption of smart factory facilities and smart factory systems. In addition, experience in utilizing information technology was found to have a significant impact on the adoption of smart factory facilities and smart factory systems. In terms of technical characteristics, product difficulty was found to have an impact on the adoption of smart factory facilities. Both smart factory system adoption and smart factory facility adoption were found to have significant effects on usage satisfaction, productivity improvement, defect rate reduction, and delivery rate improvement.

The significance of the study

The significance and implications of the results derived from the practical validation of the hypotheses formulated in this study and the various analyses involved are as follows.

First, government support does not affect the level of adoption among small and medium-sized enterprises that have adopted smart factories. Previous studies have shown a positive relationship between government support as a factor affecting adoption intention and as a trigger to promote adoption, but in this study, we analyzed companies that have adopted and utilized smart factories, and government support does not have a significant impact after deciding to adopt or when improving the level of adoption. While government support may have a significant impact on the decision to adopt and promote adoption, companies that have already adopted and are moving to the next level may feel that government support is insufficient compared to the resources they need to invest. Notably, these results are not significant for the under $10 billion group in the additional analyses conducted by revenue, suggesting that for companies of all sizes that have already adopted, the amount of government support they receive does not affect the level of adoption. Furthermore, in the group of more than 10 billion won, the results show that government support has a negative effect on the adoption of smart factory facilities, so it can be seen that when additional facilities are introduced through government support, it has a negative effect on companies because they cannot introduce the facilities they want or have to introduce unsatisfactory facilities. This means that government support can be helpful when companies are willing to adopt, but it does not have a significant impact on the stage of adoption and utilization, and in some cases, it can be seen as a negative impact.

Second, among the technical characteristics, product difficulty has a significant impact on adoption, but other factors do not. This means that product difficulty affects the level of adoption of smart factories. The significant effect of product difficulty on smart factory facility adoption among smart factory system adoption and smart factory facility adoption can be explained by the fact that when determining the level of smart factory adoption, product difficulty is not related to the characteristics of the smart factory system adoption level, but the level of smart factory facility adoption is determined by the difficulty and characteristics of the product.

Third, a significant relationship was found for information technology utilization experience, which indicates that information technology utilization experience is an important part of how well a company can adopt and operate smart factory systems and facilities, and is more influential than the inherent characteristics of each company. Therefore, based on the above, it can be said that the existing information technology utilization experience

is a factor that affects the introduction and maintenance of new smart factory systems. When determining the level of introduction of smart factories in the future, it is also a way to determine the level of introduction by first evaluating the existing company's experience with information technology. If the company's experience in utilizing information technology is sufficient, even a company that is introducing it for the first time can increase the level of introduction and introduce a high level of smart factory at once. If the company is large or has a large number of employees, but the experience in utilizing information technology is somewhat low, sequential introduction from a low stage is more advantageous to introduce and operate the smart factory and see the effect.

Fourth, the adoption of smart factory systems and smart factory facilities have a significant impact on satisfaction of use, reduction of defect rate, improvement of delivery rate, and improvement of productivity. This means that companies that introduce smart factories are satisfied with the introduction and utilization of both systems and facilities. Therefore, it is recommended that companies introducing smart factories should select facilities and systems according to the expected effect depending on their level, and while it is good to introduce both systems sequentially, it is appropriate to introduce facilities and systems simultaneously to see the utilization effect through smart factories. By introducing both systems and facilities, each company will be able to utilize and operate the smart factory more effectively if they raise the level in stages according to the appropriate time.

Implications of the study

As revealed in the previous study, the Korean government has been promoting policies with the goal of distributing 30,000 smart factories by 2022, and since that goal has been achieved, it will be necessary to further implement policies that can improve the adoption level for companies that have been distributed instead of the goal of distribution. In addition, since SMEs are a diverse industry unlike large companies, there may be limitations in increasing the adoption level through government support. Therefore, when technical support is needed, a policy that can provide technical support to SMEs by fostering companies that understand various fields of SMEs, consulting companies, and companies related to technical support is needed, and it is necessary to implement various support policies that are more effective. Furthermore, it is necessary to more closely examine what companies actually need when they move up through government support and implement policies that can actually help them.

Moreover, since the budget of government policies is limited, it is necessary to focus on supporting companies that are effective in introducing smart factories and have a high return on investment. This does not necessarily refer to the size of the company or the limitations of the industry, but rather tothe characteristics of the production environment and process stress, the characteristics of the product, the difficulty of the product, the labor intensity or the type of support workers, the level of technical proficiency, and the location conditions of the company.

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<Table 1> Demographic analysis results

Classification	Separation	Frequency (people)	Percentage (%)
Roles	Employee level	15	7.4
	Assistant, Manager	38	18.6
	Vice President, General Manager	55	27.0
	Executive level	46	22.5
	Representative	50	24.5
Work history	Less than 1 year	13	6.4
	More than 1 year - less than 3 years	22	10.8
	More than 3 years - less than 5 years	30	14.7
	More than 5 years - less than 10 years	50	24.5
	10 years or more	89	43.6
Revenue	Less than 5 billion	79	38.7
	More than 5 billion - less than 10 billion	38	18.6
	More than 10 billion - less than 50 billion	52	25.5
	More than 50 billion - less than 100 billion	12	5.9
	Over 100 billion	23	11.3
Accumulated Utilization Period	Less than 6 months	64	31.4
	More than 6 months - less than 1 year	26	12.7
	More than 1 year - less than 2 years	38	18.6
	More than 2 years - less than 4 years	38	18.6
	4 years or more	38	18.6
Number of employees	Less than 20 people	77	37.7
	More than 20 people - less than 50 people	51	25.0
	More than 50 people - less than 100 people	38	18.6
	More than 100 people - less than 300 people	22	10.8
	300 or more	16	7.8
Industry	Machinery, Metal	89	43.6
	Electrical, Electronics	30	14.7
	Textiles, Chemicals	22	10.8
	Pharmaceutical, Food & Beverage	17	8.3
	Others	46	22.5

Reduced defect rate	More than 0% - less than 5	106	52.0
	More than 5% - less than 10	63	30.9
	More than 10% - less than 20	23	11.3
	More than 20% - less than 30	7	3.4
	30% or more	5	2.5
Improve delivery rates	More than 0% - less than 5	84	41.2
	More than 5% - less than 10	66	32.4
	More than 10% - less than 20	32	15.7
	More than 20% - less than 30	13	6.4
	30% or more	9	4.4
Increase productivity	More than 0% - less than 5	76	37.3
	More than 5% - less than 10	70	34.3
	More than 10% - less than 20	30	14.7
	More than 20% - less than 30	13	6.4
	30% or more	15	7.4
Total		204	100

<table2> Results of exploratory factor analysis and reliability analysis of environmental factors, technical characteristics, and information technology utilization experience

Variables		Factors	Eigenvalues	Explanatory power (Cumulative Explanatory Power)	Commonality	Cronbach's α
Technical characteristics	Process stress7	0.888	3.006	0.2 (0.2)	0.806	0.887
	Process stress6	0.883			0.794	
	Process stress5	0.848			0.729	
	Process Stress4	0.831			0.726	
Environmental factors	External Pressure6	0.917	2.459	0.164 (0.364)	0.864	0.882
	External pressure7	0.913			0.858	
	External Pressure5	0.822			0.713	
Information Technology Experience	Technical experience4	0.900	2.416	0.161 (0.525)	0.826	0.867
	Technical experience5	0.881			0.834	
	Technical experience3	0.846			0.736	
Environmental factors	Government Support1	0.908	2.359	0.157 (0.683)	0.841	0.852
	Government Support2	0.894			0.822	
	Government Support3	0.773			0.680	
Technical characteristics	Product difficulty1	0.884	1.567	0.104 (0.787)	0.803	0.717
	Product difficulty2	0.835			0.774	
KMO				0.730		
Bartlett's Test for Sphericity		x^2		1652.265		
		Degrees of freedom		105.0		
		Probability of significance		0.000		

<Table3> Adoption level exploratory factor analysis and reliability analysis results

Variables		Factors	Eigenvalues	Explanatory power (Cumulative Explanatory power)	Commonality	Cronbach's α
Adoption Level	Introduce a facility 8	0.888	2.849	0.407 (0.407)	0.828	0.881
	Introduce a facility 7	0.868			0.812	
	Introduce a facility 5	0.746			0.665	
	Introduce a facility3	0.724			0.677	
	Introducing the system7	0.899	2.523	0.360 (0.768)	0.860	0.872
	Introducing the system8	0.849			0.815	
	Introducing the system6	0.797			0.715	
KMO				0.841		
Bartlett's Test for Sphericity		x^2		896.088		
		Degrees of freedom		21.0		
		Probability of significance		0.000		

<Table4> Exploratory factor analysis of utilization effect and reliability analysis results

Variables		Factors	Eigenvalues	Explanatory power (Cumulative Explanatory power)	Commonality	Cronbach's α
Leverage Effects	Reduced defect rate3	0.788	4.914	0.246 (0.246)	0.785	0.954
	Reduced defect rate5	0.771			0.890	
	Reduced defect rate4	0.747			0.813	
	Reduced defect rate1	0.745			0.822	
	Reduced defect rate2	0.739			0.764	
	Reduced defect rate6	0.734			0.856	
	Satisfaction with use6	0.744	4.725	0.236 (0.482)	0.779	0.955
	Satisfaction with use5	0.743			0.826	
	Satisfaction with use4	0.739			0.870	
	Satisfaction with use1	0.733			0.861	
	Satisfaction with use2	0.704			0.800	
	Satisfaction with use3	0.690			0.786	
	Improve delivery rates1	0.773	3.689	0.184 (0.666)	0.880	0.954
	Improve delivery rates4	0.760			0.877	
	Improve delivery rates2	0.757			0.899	
	Improve delivery rates3	0.696			0.863	
	Increase productivity2	0.785	3.355	0.168 (0.834)	0.826	0.925
	Increase productivity3	0.750			0.864	
	Increase productivity1	0.723			0.788	
	Increase productivity4	0.625			0.833	
KMO				0.952		
Bartlett's Test for Sphericity		x^2		4930.738		
		Degrees of freedom		190.0		
		Probability of significance		0.000		

<Table5> Focused Feasibility Analysis Results

Latent Variables	Observation Variables	Standardization Factor	Non-standardized coefficients	SE	t value	p value	SMC	AVE	CR
Government Support	Government Support 1	0.873	1				0.762	0.632	0.836
	Government Support2	0.869	0.985	0.071	13.782	***.	0.755		
	Government Support 3	0.715	0.89	0.079	11.254	***.	0.512		
External Pressure	External Pressure5	0.718	1				0.515	0.637	0.839
	External pressure bak6	0.91	1.322	0.108	12.289	***.	0.827		
	External pressure7	0.915	1.334	0.108	12.309	***.	0.836		
Process Stress	Process Stress4	0.791	1				0.626	0.528	0.817
	Process Stress5	0.771	0.865	0.075	11.579	***.	0.594		
	Process Stress6	0.859	1.001	0.076	13.109	***.	0.739		
	Process Stress7	0.841	0.973	0.076	12.823	***.	0.708		
Products Difficulty Level	Product Difficulty1	0.546	1				0.298	0.631	0.758
	Product Difficulty2	1.022	1.875	0.516	3.634	***.	1.045		
Information Technology Literacy Experience	Technical experience3	0.729	1				0.532	0.604	0.819
	Technical experience4	0.879	1.214	0.101	12.041	***.	0.773		
	Technical experience5	0.88	1.136	0.094	12.054	***.	0.775		
Smart Factory System introduction	Introducing the system6	0.743	1				0.552	0.623	0.831
	Introducing the system7	0.879	1.106	0.088	12.61	***.	0.773		
	Introducing the system8	0.889	1.187	0.093	12.741	***.	0.791		
Adoption of Smart Factory Facilities	Introduce a facility3	0.731	1				0.535	0.551	0.829
	Introduce a facility 5	0.724	0.997	0.099	10.095	***.	0.524		
	Introduce a facility 7	0.884	1.187	0.096	12.344	***.	0.781		
	Introduce a facility 8	0.885	1.272	0.103	12.355	***.	0.782		
Use Satisfaction	Satisfaction with use1	0.917	1				0.841	0.746	0.946
	Satisfaction with use2	0.88	0.983	0.049	20.098	***.	0.775		
	Satisfaction with use3	0.866	1.004	0.052	19.275	***.	0.75		
	Satisfaction with use4	0.923	1.051	0.046	22.992	***.	0.851		
	Satisfaction with use5	0.883	0.992	0.049	20.248	***.	0.779		
	Satisfaction with use6	0.837	0.945	0.053	17.766	***.	0.701		
Reject rate Decrease	Reduced defect rate1	0.881	1				0.776	0.759	0.95
	Reduced defect rate2	0.812	0.961	0.061	15.627	***.	0.66		
	Reduced defect rate3	0.809	0.956	0.062	15.507	***.	0.654		
	Reduced defect rate4	0.89	1.057	0.056	18.844	***.	0.792		
	Reduced defect rate5	0.957	1.095	0.049	22.548	***.	0.916		
	Reduced defect rate6	0.926	1.1	0.053	20.719	***.	0.858		
Productivity Enhancement	Increase productivity1	0.837	1				0.7	0.709	0.907
	Increase productivity2	0.819	0.956	0.067	14.348	***.	0.67		
	Increase productivity3	0.904	1.027	0.061	16.938	***.	0.817		
	Increase productivity4	0.916	1.051	0.061	17.311	***.	0.838		
Delivery rate Enhancement	Improve delivery rates1	0.897	1				0.804	0.818	0.947
	Improve delivery rates2	0.938	1.012	0.045	22.38	***.	0.879		
	Improve delivery rates3	0.923	1.002	0.047	21.433	***.	0.852		
	Improve delivery rates4	0.907	0.988	0.048	20.446	***.	0.822		

<Table6> Discriminant validity analysis results

	Government Support	External Pressure	Process Stress	Products Difficulty Level	Information Technology Literacy Experience	System introduction	Facilities Introduction	Use Satisfaction	Reduced defect rate	Increase productivity	Improve delivery rates
Government Support	0.632										
External Pressure	0.072	0.637									
Process Stress	0.000	0.001	0.528								
Products Difficulty Level	0.090	0.003	0.021	0.631							
Information Technology Literacy Experience	0.025	0.084	0.014	0.012	0.604						
System introduction	0.025	0.152	0.021	0.000	0.551	0.623					
Facilities Introduction	0.004	0.138	0.019	0.004	0.26	0.397	0.551				
Use Satisfaction	0.102	0.152	0.000	0.013	0.235	0.356	0.278	0.746			
Reduced defect rate	0.02	0.138	0.000	0.001	0.201	0.364	0.251	0.676	0.759		
Increase productivity	0.023	0.133	0.001	0.000	0.233	0.276	0.28	0.691	0.65	0.709	
Improve delivery rates	0.100	0.116	0.005	0.009	0.252	0.335	0.289	0.719	0.613	0.676	0.818

<Table7> Influence relationship analysis results between variables

Paths			Standardization factor (β)	Non-standardized coefficients (B)	Standard error (SE)	t-value (CR)	p-value	Adoption
Government Support	->	System introduction	-0.019	-0.018	0.06	-0.301	0.763	Dismiss
External Pressure	->	System introduction	0.202	0.211	0.066	3.221	0.001	Adoption
Process Stress	->	System introduction	0.039	0.031	0.046	0.689	0.491	Dismiss
Product difficulty	->	System introduction	0.075	0.118	0.085	1.388	0.165	Dismiss
Information Technology Experience	->	System introduction	0.705	0.714	0.09	7.93	0.000***	Adoption
Government Support	->	Introduce a facility	-0.114	-0.109	0.07	-1.544	0.123	Dismiss
External Pressure	->	Introduce a facility	0.261	0.269	0.076	3.518	0.000***	Adoption
Process Stress	->	Introduce a facility	0.052	0.041	0.053	0.776	0.438	Dismiss
Product difficulty	->	Introduce a facility	0.134	0.207	0.1	2.07	0.038	Adoption

Information Technology Experience	->	Introduce a facility	0.493	0.492	0.085	5.813	0.000***	Adoption
System introduction	->	Improve delivery rates	0.411	0.441	0.083	5.317	0.000***	Adoption
Introduce a facility	->	Improve delivery rates	0.306	0.334	0.082	4.091	0.000***	Adoption
System introduction	->	Increase productivity	0.34	0.359	0.083	4.297	0.000***	Adoption
Introduce a facility	->	Increase productivity	0.339	0.362	0.085	4.268	0.000***	Adoption
System introduction	->	Reduced defect rate	0.472	0.461	0.077	5.958	0.000***	Adoption
Introduce a facility	->	Reduced defect rate	0.228	0.226	0.072	3.12	0.002	Adoption
System introduction	->	Satisfaction	0.447	0.477	0.083	5.762	0.000***	Adoption
Introduce a facility	->	Satisfaction	0.273	0.296	0.08	3.712	0.000***	Adoption

Enhancing SME Performance through Intellectual Capital: A Systematic Review

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Abstract

Purpose: This paper systematically reviews the literature on the impact of intellectual capital (IC) on Small and Medium-sized Enterprises (SMEs) to identify trends, gaps, and future research directions. It aims to elucidate how IC, comprising human, structural, and relational elements, influences SME performance.

Design/Methodology/Approach: The methodology involved a comprehensive literature review using a structured approach inspired by (Paul & Dhiman, 2021a). It included seven steps: formulating research questions, selecting databases, article screening, applying the PRISMA protocol, and synthesizing findings.

Findings: The review demonstrates a consistent positive relationship between IC and SME performance across diverse geographical contexts. Human capital directly impacts performance, while structural and relational capitals influence it indirectly through innovation capability and customer relationships, respectively.

Practical/Implications: The findings suggest that SME managers should focus on enhancing human capital through skills development, leveraging structural capital to improve operational efficiency, and nurturing relational capital to strengthen customer relationships and market positioning.

Originality/Value: This paper contributes to academic discourse by consolidating current knowledge on IC's role in SME performance, offering practical insights for stakeholders to optimize IC management strategies.

***Keywords**: Intellectual capital, SMEs, performance, human capital, structural capital, relational capital, literature review*

Introduction

In today's business landscape, the performance of Small and Medium-sized Enterprises (SMEs) is pivotal for economic growth and innovation. SMEs constitute a substantial segment of businesses globally and play a crucial role in fostering employment opportunities and community development. However, these enterprises face distinctive challenges such as resource constraints, intense market competition, and the necessity for continual innovation. Intellectual capital (IC), encompassing human, structural, and relational elements, has emerged as a critical factor in enhancing SME performance and achieving sustainable competitive advantage.

The mid-1920s ignited the growth of intellectual capital, marking a shift in the economy towards the efficient utilization of intangible resources for value creation. This paradigm shift from tangible to intangible resources has led to the recognition of intellectual capital as a potent source capable of enhancing the competitive position of firms (Guthrie & Petty, 2000; Maji & Goswami, 2015)

IC research has evolved through various stages, beginning with efforts to understand its conceptualization and moving towards management, measurement, and reporting practices. Scholars argue for a third stage focusing on critical analysis of IC practices in action (Dumay, 2014; Dumay &Garanina, 2013). This evolution reflects a growing awareness of IC's role in bridging the gap between book value and market value, emphasizing its hidden value in firm performance (Edvinsson et al., 1997; Lev & Lev, 2001)

The foundational understanding of IC encompasses diverse perspectives and definitions, highlighting its essence as a strategic resource (Barney, 1991; Peteraf, 1993; Wernerfelt & Wernerfelt, 1984). It encompasses knowledge, experience, relationships, and technology that create value beyond traditional accounting

metrics(Edvinsson et al., 1997; Röös et al., 1997; Stewart et al., 1997). The term 'intellectual capital' spans a broad spectrum of intangible assets critical for organizational value creation, including those not recognized under traditional accounting standards(García-Meca & Martínez, 2005)

From a resource-based view, IC integrates tangible and intangible resources to achieve sustainable competitive advantage (Penrose, 1995).This perspective underscores the strategic importance of effectively managing knowledge assets through practices such as knowledge management (KM), which synergistically interacts with IC to enhance organizational effectiveness(Huang & Wu, 2010; Shih et al., 2010)

This paper reviews empirical studies on various aspects of IC in developed and developing economies, offering insights into its evolution and current status. It categorizes IC into human, structural, and relational components(Edvinsson et al., 1997; Mavridis &Kyrmizoglou, 2005), emphasizing their roles in driving innovation, improving productivity, and nurturing customer relationships(Bontis, 1998, 2000; Röös et al., 1997)

This paper aims to systematically review existing literature on how intellectual capital influences SME performance. By synthesizing findings from various studies, it seeks to identify trends, gaps, and future research directions in this domain. Additionally, the paper proposes a research roadmap to guide future studies, offering a structured framework for exploring strategic management of intellectual capital to bolster SME success.

Through this systematic review, the paper aims to contribute to academic discourse by elucidating the role of intellectual capital in enhancing SME performance. Its findings will provide practical insights for SME managers and policymakers, outlining strategies to effectively harness intellectual capital for sustained growth and competitiveness.

Understanding the impact of intellectual capital on SME performance is crucial for guiding future research and benefiting key stakeholders. To this end, this paper addresses two interrelated research questions:

RQ1: How does intellectual capital as a whole impact SME performance?

RQ2: How do the individual components of intellectual capital (Human, Structural, and Relational) influence SME performance?

The subsequent sections of this paper include a methodology outlining article selection and analytical framework, results and discussion presenting findings and critiques, and a conclusion detailing future directions and limitations of this study.

Methodology

The literature review aims to comprehensively understand the topic, identify knowledge gaps, propose new research directions, and outline plans to contribute to the field (Donthu et al., 2021). The review process involved seven steps, inspired by the methodology outlined by(Paul & Dhiman, 2021b) as detailed below.

Initially, the analysis focused on existing literature to review the current research landscape in the specified area. This step involved generating a list of keywords that were strategically combined to expand the scope of inquiry.

In the second step, the research question was formulated to guide the study and ensure alignment with the evolving needs of the field. Relevant literature reviews on related topics were also incorporated, shaping the final query centered around "(intellectual capital" and "organizational performance" and "SME"). The third stage involved consulting the Google Scholar database, a widely respected academic resource. The study was constrained to articles published from 2010 to 2023.

Following the delineation of study limits, the fourth and fifth stages focused on data collection. A total of 152 articles were initially identified. After screening titles and abstracts, 120 articles were excluded as they did not directly address the study topics beyond mentioning some keywords. From the remaining 32 articles, 20 were further excluded for not meeting the defined research area criteria.

The final stages, sixth and seventh, entailed a systematic literature review guided by the PRISMA protocol (Moher, 2009), following the example set by(Tranfield et al., 2003). This comprehensive approach facilitated the synthesis of best research practices pertaining to the central theme and its implications. It not only documented primary research avenues but also identified prospective areas for future investigation.

Discussion and Results

In this section, we use descriptive statistics and commentary to answer the first two research questions:

RQ1: How does intellectual capital as a whole impact SME performance?

RQ2: How do the individual components of intellectual capital (human, structural, and relational) influence SME performance?

The data reported in Table I forms the basis for this section, along with further analysis that delves deeper, beyond the descriptive results, to complement the discussion.

Table I: Summarized Findings

Title	Year	Country	Theoretical Framework	Sample Selection	Analysis Method	Key Findings
Role of Intellectual Capital on the Organizational Performance of Electrical and Electronic SMEs in Pakistan (Khalique et al., 2011)	2011	Pakistan	Intellectual Capital Theory	223 registered electrical and electronics SMEs, 82 responses from 50 SMEs (41% response rate)	Correlation, Multiple Regression	Positive relationship between intellectual capital components and organizational performance. Customer and structural capital significantly impact performance; human capital does not.
Does Intellectual Capital Improve on The Performance of SME's?(Shinta Dewi et al., 2019)	2019	Indonesia	Knowledge-Based View (KBV)	149 SMEs from batik industry clusters in Central Java, 74.5% response rate	EFA, CFA, PLS, Sobel Test	Intellectual capital affects competitive advantage and performance. Structural and relational capital affect performance indirectly through competitive advantage.
Intellectual Capital and Firm Performance Correlation: The Mediation Role of Innovation Capability in Malaysian Manufacturing SMEs Perspective. (Aljuboori et al., 2022)	2021	Malaysia	Resource-Based View (RBV) Theory	Stratified sampling of 262 manufacturing SMEs	PLS-SEM (Structural Equation Modeling)	Positive relationship between structural/relational capital and innovation capability. Human capital directly affects performance. Innovation capability mediates structural/relational capital and performance.
Intellectual Capital and SMEs Performance in Pakistan: The Role of Environmental Turbulence(Arshad & Arshad, 2018)	2018	Pakistan	Resource-Based View (RBV) Theory	350 textile SMEs from a population of 27,250	PLS-SEM	Intellectual capital positively affects SME performance. Environmental turbulence moderates this relationship.
Intellectual capital efficiency and organizational performance: In the context of the pharmaceutical industry in Bangladesh(Chowdhury et al., 2019)	2017	Bangladesh	VAIC™ Model	23 pharmaceutical companies listed on Dhaka Stock Exchange	Multiple Regression Analysis	VAIC components influence asset turnover and ROA, not ROE. Human capital efficiency influences ROA.
Intellectual Capital, Firm Performance, and Sustainable Growth: A Study on DSE-Listed Non-financial Companies in Bangladesh(Sohel Rana & Hossain, 2023)	2023	Bangladesh	Resource-Based View (RBV) Theory	69 DSE-listed nonfinancial companies (2017-2021)	MVAIC, Robust Fixed Effect Regression	MVAIC, ICE, HCE positively impact performance and growth. SCE not significant. RCE negatively impacts performance and growth.

Title	Year	Country	Theoretical Framework	Sample Selection	Analysis Method	Key Findings
Is the influence of intellectual on firm performance homogeneous? (Gopal Maji & Goswami, 2020)	2020	India	VAIC™ Model	253 listed firms (knowledge-based and traditional sectors)	Pooled OLS, Quantile Regression Analysis	ICE and CEE positively influence performance across sectors. Impact varies across performance quantiles.
The Impact of Dimensions of Intellectual Capital on Small and Medium Enterprise (SMEs) Performance in Pakistan with a Mediating Role of Absorptive Capacity (Khan & Wan Yusoff, 2023)	2023	Pakistan	Resource-Based View (RBV) Theory	327 SMEs from South Punjab	PLS-SEM	Positive influence of intellectual capital dimensions on SME performance. Absorptive capacity mediates the relationship.
The Impact of Intellectual Capital on Business Uncertainty and Business Performance of Small Enterprises: With Special Reference to Galle District in Sri Lanka (Ranatunga et al., 2023)	2023	Sri Lanka	Intellectual Capital Theory, and Business Performance	150 small enterprises in Galle District	PLS-SEM	Intellectual capital positively impacts business performance, negatively impacts business uncertainty. Business uncertainty negatively impacts performance.
The Impact of Intellectual Capital on SME Performance: Competitive Advantage Mediation (Case Study in Indonesia) (Hidayat et al., 2023)	2023	Indonesia	Resource-Based View (RBV) Theory, Intellectual Capital Theory, and Competitive Advantage Theory	207 SME owners in DKI Jakarta	SEM (AMOS)	Intellectual capital and competitive advantage positively influence SME performance.
The Impact of Intellectual Capital on Firm Performance: Evidence from Listed Consumer Staples Sector Firms in Sri Lanka (Sonali & Kaushala, 2023)	2022	Sri Lanka	VAIC™ Method	25 listed consumer staples companies (2012-2020)	Panel Data Analysis	Human capital and capital employed positively impact performance. Structural capital not significant. Leverage impacts performance.
The Impact of Intellectual Capital on Firm Performance of Manufacturing SMEs in Malaysia(M. Aljuboori& Singh, 2021)	2021	Malaysia	Resource-Based View (RBV) Theory	Conceptual study, literature review	Systematic Literature Review	Intellectual capital significantly affects performance of manufacturing SMEs. Future research needed to expand framework.

Location

The studies reviewed span a diverse range of countries, providing a broad geographical perspective on the impact of intellectual capital on SME performance. These countries include Pakistan, Indonesia, Malaysia, Bangladesh, Croatia, India, and Sri Lanka. The inclusion of these various regions ensures a comprehensive understanding of how intellectual capital influences SME performance within different cultural, economic, and regulatory environments. This geographical diversity is crucial as it allows for the examination of both commonalities and differences in the way intellectual capital impacts SMEs across different contexts. For instance, the economic development level and regulatory frameworks in these countries can affect how intellectual capital is leveraged and its consequent impact on performance.

Research Methods

The methodologies employed across the studies are varied, reflecting the complex nature of intellectual capital and its multifaceted impact on SME performance. Many studies utilized surveys and questionnaires to gather primary data from SME owners, managers, and employees, with response rates ranging significantly. For instance, some studies achieved response rates as high as 74.5%, ensuring robust data collection. Structural Equation Modeling (SEM) was extensively used to analyze complex relationships between intellectual capital components and SME performance, allowing for the assessment of direct and indirect effects.

Multiple regression analysis was another common method used to determine the strength and nature of relationships between variables, providing detailed insights into how different aspects of intellectual capital affect performance. Descriptive analysis, ANOVA, and regression analysis were also applied to explore interactions between intellectual capital and other organizational factors. Furthermore, pooled OLS and quantile regression analysis were employed to understand the varying impacts of intellectual capital across different performance levels, while panel data analysis was used for longitudinal studies to assess impacts over time.

Frameworks and Models

Various theoretical frameworks and models were employed to investigate the impact of intellectual capital on SME performance. Intellectual Capital Theory was frequently used, focusing on the components of intellectual capital and their direct impacts on performance. The Resource-Based View (RBV) Theory examined how intellectual capital serves as a strategic resource that provides competitive advantage, highlighting the importance of firm-specific resources. The Knowledge-Based View (KBV) considered how knowledge and intellectual capital drive firm capabilities and performance. The Value-Added Intellectual Coefficient (VAIC™) Model was used to measure the efficiency of value creation from intellectual capital components, while the MVAIC Model, an extension of the VAIC™ Model, included additional variables to assess intellectual capital efficiency and its impact on firm growth and performance.

Impact of Intellectual Capital on SME Performance

Addressing the first research question, the review indicates a generally positive relationship between intellectual capital and SME performance across different contexts. In Pakistan, intellectual capital components, particularly customer and structural capital, significantly impact performance, explaining a considerable portion of the variance. In Indonesia, intellectual capital contributes to competitive advantage and indirectly influences performance through structural and relational capital. Studies in Malaysia highlight strong positive relationships between structural/relational capital and innovation capability, with human capital directly impacting performance.

In Bangladesh, VAIC components are influential in asset turnover and ROA, underscoring the importance of efficient use of intellectual capital. Croatian studies show that intellectual capital, coupled with innovation culture, positively impacts performance, though organizational climate is not significant. In India, the impact of intellectual capital varies across different performance quantiles, suggesting heterogeneous effects. In Sri Lanka, human capital and capital employed have positive impacts on performance, while structural capital is less significant.

Impact of Individual Components of Intellectual Capital

Regarding the second research question, the findings illustrate the distinct roles of human, structural, and relational capital in influencing SME performance. Human capital consistently shows a direct impact on performance, emphasizing the critical role of employee skills, expertise, and innovation. Structural capital often influences performance indirectly through its effects on organizational processes, innovation capability, and competitive advantage.

Relational capital positively impacts performance by enhancing customer relationships and market positioning, as evidenced in studies from Indonesia and Malaysia. These findings highlight the multifaceted nature of intellectual capital, demonstrating that its components contribute to SME performance in various ways, both directly and indirectly.

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Financial Challenges Posed to MSMEs Due to Recent Development in the Indian Economy: A Case Study of Odisha, India

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Abstract

Purpose – Finance is the transformative force that drives each company, organization, and industry. Developed and developing countries like India have experienced substantial growth in recent years, attributed to the progress of MSMEs (Micro, Small, and Medium Enterprises). However, the industries are facing significant challenges due to the financial crisis. Nevertheless, financial procurement for MSMEs is impacted by notable obstacles. Hence, this research aims to, identify and examine the determinants that contribute to the economic hardships faced by Indian MSMEs, with a particular focus on the Odisha area.

Design/methodology/approach – The current research used the Fuzzy Analytic Hierarchy Process (AHP) and Fuzzy Decision-Making Trial and Evaluation Laboratory (DEMATEL) methodologies. The fuzzy Analytic Hierarchy Process (AHP) was used to prioritize and evaluate the identified factors. Subsequently, the DEMATEL (decision-making trial and evaluation laboratory) method was applied to categorize the components into cause-and-effect clusters.

Findings – The survey findings indicate that collateral security, credit rating, transaction cost, and processing charge are the primary factors contributing to the financial issues MSMEs face. The DEMATEL technique identified credit rating and collateral security as the primary elements generating the most significant impact. At the same time, the exclusion of MSMEs by MFIs emerged as the most influential driving factor.

Practical Implications - The present research enriches the understanding and awareness of managers and policymakers about the financial difficulties linked to the MSMEs in Odisha. Additionally, it enables managers to investigate and implement diverse strategies such as receivables monitoring, investigating other financial possibilities, preventing excessive credit extension, and reducing debt. This would enable managers to control and allocate their capital effectively, preventing any financial challenges to expanding MSMEs.

Originality/value – Previous research has mostly addressed the general obstacles that impede the development of MSMEs as a whole. This research is the first effort to identify, prioritize, and assess the financial obstacles faced by MSMEs in Odisha. This is achieved by integrating experts' inputs, completing a comprehensive literature study, and using fuzzy AHP and DEMATEL approaches. These strategies facilitate the identification of cause-and-effect correlations and provide the groundwork for future studies. This study article examines explicitly the financial issues encountered by MSMEs in Odisha, taking into account the local working environment.

Keywords: *Micro Small and Medium Enterprises (MSMEs), Fuzzy-Analytic Hierarchy Process* (F-AHP), F- DEMATEL

Analysis of the Volatility Effect of Stock Market Caused by Policy Events

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Abstract

The stock market plays a significant role in a country's economic development. However, the government's intervention in the stock market has always been a subject of controversy, with advocates for and against the influence of the state. This paper analyzes the indispensability of policy intervention in the sound development of China's stock market by summarizing the views of different schools of thought and applying these views to China's unique national background and economy. On this basis, the article employs the event study method to empirically investigate a series of significant policy events that occurred from 2015 to 2023, exploring the time effects of these events on the volatility of China's stock market. This paper aims to provide a reference for policymakers, contributing to the healthy and stable development of the stock market.

Keywords: *Stock Market, Policy Event, Volatility Effect, Time Effect.*

Introduction

There has been a long-standing debate between the Keynesians and the classical schools of thought regarding the necessity of the government's intervention during periods of stock market volatility. This divergence in opinion was demonstrated during the Great Depression when the Keynesians advocated for monetary authorities to timely utilize and implement flexible economic policies in response to external shocks as a means to maintain economic stability. The classical school, however, insisted on market self-regulation and opposed government intervention.

Regarding the condition of China's economy, government intervention has its own rationale. China's stock market is the typical "policy market", where stock returns are significantly influenced by government policies and "government failure" occurs occasionally. A key issue in addressing these problems is the positioning of the government in the stock market. An increasing amount of research findings illustrate that reasonable policy interventions may effectively reduce volatility, increase stability, and ultimately promote the healthy development of the stock market.

Hence, the paper aims to explore how distinct types of policy intervention events affect stock market volatility, hopefully providing a valuable reference for the formulation of future related policies and for maintaining stable market development. To do so, this paper employed the event study method to systematically investigate the time effects of abnormal stock market volatility triggered by different categories of policy intervention events that occurred in China's stock market from 2015 to 2023.

The main contributions of this paper are as follows. Firstly, this paper systematically investigates the specific effects of different types of policy interventions on the stock market over a longitudinal time frame. Although many scholars have studied the impact of China's policy interventions on the stock market, most have focused on shorter time periods or particular interventions. While these attempts offer valuable knowledge, a longitudinal perspective is required to cohesively encompass and understand the multitude of policy events. Therefore, this article comprehensively covers the stock market's responses to different policy interventions from 2015 to 2023, providing a more complete and coherent perspective. Furthermore, policy interventions were classified based on the nature of the events to analyze the impacts of various policy interventions more accurately and precisely.

Secondly, this paper adopts the event study method to accurately identify abnormal fluctuations in the stock market before and after the occurrence of events, thereby analyzing the effectiveness of interventions and their impact on the stock market. Compared to traditional econometric methods such as the Generalized Auto Regressive Conditional Heteroskedasticity (GARCH)

model and multiple regression models, the event study method provides a clear illustration of the immediate impact of policy events on the stock market. While researchers have increased the use of the event study method in recent years, most studies remain limited to certain major events. The current study, however, utilized daily data from the stock market to specifically measure and compare the impact effects of different types of policy interventions, increasing the accuracy of identifying abnormal stock market fluctuations. Furthermore, by assessing the normalcy, excessiveness, or insufficiency of market reactions, the actual effects of policy interventions were further analyzed.

Lastly, this paper adopts a multi-time window strategy to study the dynamic response effects of policy interventions on stock market volatility. Compared to conventional single-time window research methods, the multi-time window setup offers the benefit of revealing differences in the effects of policy interventions at different time points, thereby providing findings with more detailed analysis.

Literature Review

Research on the Necessity of Government Intervention

The government's intervention in the stock market remains a topic of ongoing debate. Various scholars have argued that governments should minimize interference with the market, as allowing market forces to determine stock prices is a fundamental determinant of a healthy economy. Furthermore, as Zhou, Z.Q. et al. argued, that excessive intervention may lead to unintended consequences such as lowered market values and increased interest rates.[1] Conversely, Zhang, J. et al. demonstrated support for the government's intervention in certain circumstances, such as periods of extreme volatility or financial instability[2].

Various scholars have also documented and assessed the effectiveness of government measures during periods of volatility. For instance, Zeng, F. et. al. conducted a descriptive analysis of fluctuation that occurred during 2015 in the Chinese stock market, confirming that the Chinese government's instruments and actions did not work effectively to successfully recover the stock market[3]. Marobhe, M.I. et. al. examined the effectiveness of government interventions in protecting stock markets during the COVID-19 pandemic, which demonstrated that the government policymakers and regulators should intervene in the stock market as soon as possible to reduce wide spread investor panic and regulate the market[4].

Research on the Means and Effects of Government Intervention

The Chinese government's capabilities to intervene in the stock market are best showcased by the 2015 stock market crisis. This event is also considered as a crucial topic in academia. To illustrate, Jiang, X. researched the impact of government bailout measures on individual stock risk and liquidity. The research proposes that the government should improve the legal system and strengthen market supervision to ensure a stable market operation[5]. In contrast, a different investigation by Feng, D. on the timing and scope of government intervention, suggests that bailouts need to be well-timed and neither too early or too late[6]. Essentially, bailouts should also be simultaneously controlled strictly in terms of their scope. Zhou, J. offered a distinct perspective on government interventions by analyzing the specific impacts of various policy adjustments on market volatility in the Chinese stock market. The findings suggest that the government should focus on improving the market systems, thereby better leveraging the leading role of the market[7].

The Necessity of Government Intervention in China's Stock Market

Government Intervention Theory

Keynesians and classicists have long debated the necessity for the government's interference in the stock market. The following paragraphs summarize the fundamental beliefs and views that Keynesians and classicists hold, providing an analysis of the key differences.

The Keynesian school of thought supports government policy intervention in the market for the following reasons. Firstly, they assert that government intervention regulates financial intermediaries. Since financial intermediaries are the core of the financial system, economic crises may be effectively contained and averted through careful maintenance and normalization of intermediaries. As such, the government should intervene in the market as early as possible to restore the effectiveness of financial intermediaries.

Secondly, Keynesian scholars assert that government intervention may alleviate market liquidity shortages. When emerging economies face systemic crises, it is essential to solve the problem of insufficient liquidity that domestic enterprises experience. At the same time, accounting for the stability of the exchange rate to prevent capital outflow is equally important. The method of operating interest rates to inject liquidity, just as what the United States and other Western countries have done in the past, is not applicable. Furthermore, compared to direct subsidies to enterprises and banks, stock market intervention is a more transparent and effective response to crises. Finally, government intervention may quell market panic and prevent the dissemination of risk. This stems from the belief that the financial system is intertwined and interconnected, such that a single lack of confidence in one sector may spread risk throughout the entire financial system. Therefore, government intervention could effectively manage and mitigate risk by reducing panic and bolstering confidence, ultimately preventing widespread risk contagion.

However, in response to behavioral biases exhibited by investors and possible market manipulation by financial

institutions, classists typically oppose government intervention in financial markets. This opposition manifests in the form of rejecting any government assistance to stock markets during financial crises. This stems from the central opinion that government bailouts may lead to moral hazard and adverse selection issues. Specifically, as governments are expected to provide a safety net for financial institutions, entities, and investors might be more inclined to engage in high-risk businesses and investment projects. The negative impact of government assistance is evident when profits are pocketed by investors, while losses are shouldered by the government.

In serious cases, large institutional investors might even exploit government bailouts. In turn, this may cause market price distortions or reduced market information efficiency. As an example, we will examine the quantitative easing policy implemented by the Federal Reserve in 2020. Strategic investors anticipated the introduction of this policy and deliberately lowered their expectations of the economic fundamentals, resulting in a significant V-shaped reversal in financial asset prices in the period surrounding this specific government intervention. Overall, the policy failed in achieving its objective by weakening the effects of the government's attempts to rescue the market, while also harming the interests of investors. Furthermore, the long-held belief in market supremacy in Western societies is another strong argument against government market intervention[8].

The Necessity of Government Intervention on China's Stock Market

Historically, the foundation of China's stock market has been inextricably linked with the Chinese government. Inevitably, the current stock market is also closely interconnected with the government's intervention. The original intention of establishing China's stock market during the early 1990s stemmed from the urgent need to alleviate capital issues faced by state-owned enterprises[9]. Since its establishment, state-owned enterprises have enjoyed the priority of issuing rights. The government's early involvement in the stock market has created an economic system deeply intertwined with politics, as both the establishment and issuance system of the stock market reflect powerful political power. As such, the risk and danger of stock price collapse have also been closely related to political enterprises and the political environment in China[10].

Furthermore, the government prohibits the banking system from directly participating in stock market trading. This stipulation enabled individual investors to become the main traders in the market. Consequently, this has given rise to a series of irrational investment market characteristics such as high turnover rates and a clear tendency toward speculation[11]. Moreover, due to the gradual opening of China's financial sector to the international market in recent years, foreign capital has become a significant force in the stock market, affecting the market's stability. Therefore, these changes require active government intervention to achieve effective regulation.

Thirdly, in terms of institutional reform, the Chinese government holds the dual responsibility of promoting stock market trading system reforms while also maintaining market stability. In terms of its trading systems, the government actively intervenes to effectively manage the institutional impact brought about by the reforms. For example, since 2010, the government has allowed investors to engage in leveraged margin trading. This rapidly expanded the scale of margin financing within a mere five years. However, while the financing trading system may provide the market with more abundant liquidity and improve pricing efficiency, a lack of regulation may also lead investors to over-leverage, ultimately leading to stock market crashes. This is also a key factor that triggered the stock market crash that occurred in China, in 2015[12]. The market crash led to forced government market-saving measures.

Above all, government intervention permeates every aspect of China's stock market, foundation, development, and reform[13]. Hence, when the stock market experiences abnormal fluctuations, there is a natural necessity for government interference. Having established the necessity of government intervention in China's stock market, this paper aims to investigate the impact such intervention has on stock market volatility and to anticipate the future effects of policy interventions.

Research Methodology

Definition and Classification of Policy Events

Given the diverse ways in which a multitude of policy events could potentially affect China's stock market, the chosen sample of policy events was reclassified according to the nature and content of these events to enhance specificity and improve forecasting accuracy. The samples were then categorized into the following categories: market rule and supervision, international policy, economic policy (i.e., monetary policy and fiscal policy), and important remarks made by the spokesperson. The selection of policy events in this paper abided by the following three fundamental principles.

□1□ Relevance

The selected policy events should exhibit a strong relevance and correlation to the stock market, which is the primary and most fundamental principle. This was necessary given that a variety of policies, regulations, or rules are introduced on a yearly, monthly, or even weekly basis. Hence, only events with high relevance were included as policy events in the analyses. Furthermore, financial policies may be subdivided into stock market policy, bond market policy, and foreign exchange market policy among others. Therefore, it was necessary that

only policy events with high relevance to the stock market were chosen as samples for this research.

□2□ Comprehensiveness

The selected policy events were comprehensive and influential, impacting the overall stock market or with the potential to do so rather than policies that affect a single industry or company. For instance, policy measures on real estate regulation introduced by the state may impact the stock price fluctuations of real estate companies. However, this policy is unlikely to impact the entire stock market, leading to the exclusion of this policy from analyses. On the other hand, measures introduced by the state for the banking and securities industry are more likely to have a direct impact on the overall market as they influence stakeholders and entities regardless of industry. A great example is lowering the reserve requirement ratio of banks and regulatory measures on the financing and securities business. In this case, this event would be included in the sample of policy events.

□3□ Impact

The policy events studied in this paper are broad policies, covering stock market-related policies, regulations, and systems, as well as macro events and media reports that were determined to have an impact on the stock market. During the selection process of identifying impactful events that influenced the stock market, policy events with a greater impact on stock market volatility will be the primary focus of the paper to comprehensively reflect the actual impact of the policies on the stock market.

Based on the aforementioned principles, this paper conducted queries, identifications, and screening of events that occurred between January 1, 2015, and December 31, 2023, to derive a total of 187 policy events that fulfilled the three important criteria of a policy event as described above.

Table 1 - Definition and Classification of Policy Events

Event type	Definition
Market rule and supervision	Policies, documents, regulations, etc. formulated to maintain the healthy development and system improvement of the securities market, and trading rules, tax rate adjustments, and other events that affect market rules.
Economic policy	1.Monetary Policy: A series of guidelines, policies, and measures adopted by the People's Bank of China to control and regulate the money supply and credit 2.Fiscal policy: Basic guidelines established by the state for understanding fiscal allocation activities and handling fiscal allocation relationships
International policy	Policy events that occur in the international market and have a major impact on the domestic stock market.
Important remarks of the spokesperson	Important government meetings, speeches by leaders, and remarks published by important newspapers and periodicals

Research Data

The A-share composite index of the Shanghai stock market was selected for the time frame ranging from January 1, 2015, to December 31, 2023. This stock market data originated from Wind Information.

Policy events are defined as important events that affected China's stock market during the timeframe of January 1, 2015, to the end of December 2023. Data on important policy events were sourced from the official website of the People's Bank of China, the official website of the China Securities Regulatory Commission, the official website of the Shanghai Stock Exchange, and the official website of the Shenzhen Stock Exchange. The websites of major financial media were also included as sources, such as the official website of the Securities News of China, the official website of the Securities Daily, and the official website of Sina Finance.

Research Method

The window of policy event research is divided into three parts: estimation window, event window, and post-event window, as illustrated in Figure 1 below. is the estimation window, is the event window, and is the post-event window. The multi-length window method was chosen and three event window periods were [-5, 5], [-10, 10] and [-20, 20] were set. In addition, (20, 40] was used as a post-window period to conduct stability tests, and the estimation window is set as [-60, -20.

This method was chosen as it effectively examines the impact of various policy events on the stock market in different time intervals while avoiding interference potentially caused by accompanying events in a single window period.

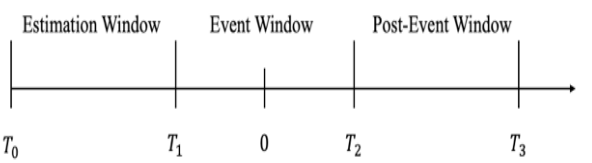

Figure 1 - Definition of Event Window

Research Variable Selection

□1□ Actual rate of return :

(1)

represents the closing price index of the Shanghai Composite Index on the t day.

□2□ Normal rate of return :

The normal rate of return is the expected level of return on the Shanghai Composite Index, assuming that no policy event has occurred. This paper estimates the normal rate through a constant mean return model, which stipulates the average value of the rate of return in the estimation window as the normal rate of return.

(2)

N represents the number of days in the estimation window, while represents the actual rate of return of the Shanghai Composite Index on day t. In this study, a multi-event window period method is adopted. To standardize calculation, the estimation window period for the normal rate of return is uniformly set to [-60, -20.

□3□ Abnormal rate of return A:

Abnormal rate of return refers to the abnormal fluctuation of the Shanghai Composite Index which deviates from the normal rate of return due to the influence of policy events.

(3)

Cumulative Abnormal rate of return CAR:

(4)

Results of Empirical Analysis

Frequency Statistics of Policy Events

Based on the classification of policy events above, the total occurrence of each event type was conducted. Between 2015 and 2023, there were 96 market rule and regulation events, accounting for 51.3% of the sample policy events. This suggests that irregularities in China's stock market are relatively serious. The frequency of significant economic policy events and significant statements were roughly the same, each accounting for approximately 20%, while international policy events occurred less frequently, accounting for 8.6% of the total sample. These findings highlight the Chinese government's focus and emphasis on market regulation interventions. Specifically, the policy events were attempts to accelerate the improvement of the market system through means such as legal regulations and infrastructure development to effectively leverage the decisive role of the market and address market failures.

Looking at the data through a chronological lens, an upward trend was observed in the occurrence of international policy events and economic policy events from 2015 to 2023. These events were likely to be closely related to the complex and changing circumstances happening worldwide, along with the escalation of trade disputes in recent years. Due to these changes in the global economic landscape and adjustments in financial policies worldwide, China has made attempts to adapt by introducing corresponding economic policies and making structural adjustments. Alternatively, the increase in the frequency of international policy events may be attributed to the continuous opening of China's A-share market.

Table 2 - Statistics of Policy Events

Event type		Number of events
Market rule and supervision		96
International policy		16
Economic policy	Monetary Policy	40
	Fiscal policy	
Important remarks of the spokesman		35

The Overall Trend of Various Policy Events

From 2015, the data demonstrates a series of significant spikes in both directions, highlighting the sensitivity and vulnerability of China's stock market to policy events. An interesting trend of extreme volatility can be observed from 2019 until 2020, marking time periods of either increased economic uncertainty or influential policy actions that have had significant impacts on stock markets. These particular fluctuations were normalized slowly in the size of the unusual returns, as time progressed. This could be an indication that the market gradually adapted to the frequency of policy changes, with investor reactions becoming more accustomed to the changes and hence, less extreme.

The reasons for this normalizing trend may be attributed to the following reasons. On one hand, the growth, development, and gradual expansion of China's stock market and the adoption of rational investment by investors have minimized the impact of political events on the stock market. Alternatively, the stock market policies formulated by relevant authorities may have become more refined. This is evident by the observation that while the frequency of stock market policy events has increased, the abnormal market volatility caused by political events has decreased significantly. This is an indication that the Chinese government has been exercising more caution in the introduction and implementation of stock market policies, while also highlighting the gradual maturation and evolution of China's stock market.

With regards to the trend of changes caused by various policies over time series, the abnormal rate of return shows a gradual flattening trend over time for most types of policy events, reaching a plateau. This may be attributed to the increasing frequency of policy events, as previously highlighted, with the market becoming more adept at anticipating and responding to economic policy changes.

In terms of economic policy events, abnormal returns were most volatile around 2017. After this period of volatility, the severity of fluctuations appears to be less extreme, as the market trend exhibits a slower fluctuation pattern with fewer sharp spikes. Similarly, for market rule and supervision events, fluctuations in the abnormal return rates demonstrate a gradual decline. Although the stock market experienced volatility in both 2018 and 2020, the frequency and magnitude of fluctuations indicate a gradual decrease.

For international policy events, a sharp peak in the stock market was observed around 2018, marking an intense fluctuation. This may be attributed to the inclusion of A-shares in the global emerging market index system. Market volatility before and after 2018 was less extreme. Finally, for policy events that involve remarks made by the spokesman, a consistent directional impact of these events was not found over the years. This implies that the overall impact on the market mainly relies on the content and market condition at the time of each speech.

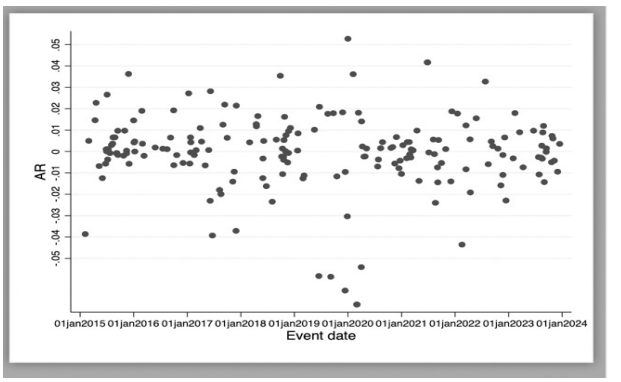

Figure 2 - Scatter Plot of Abnormal Return of Policy Events from 2015 to 2023

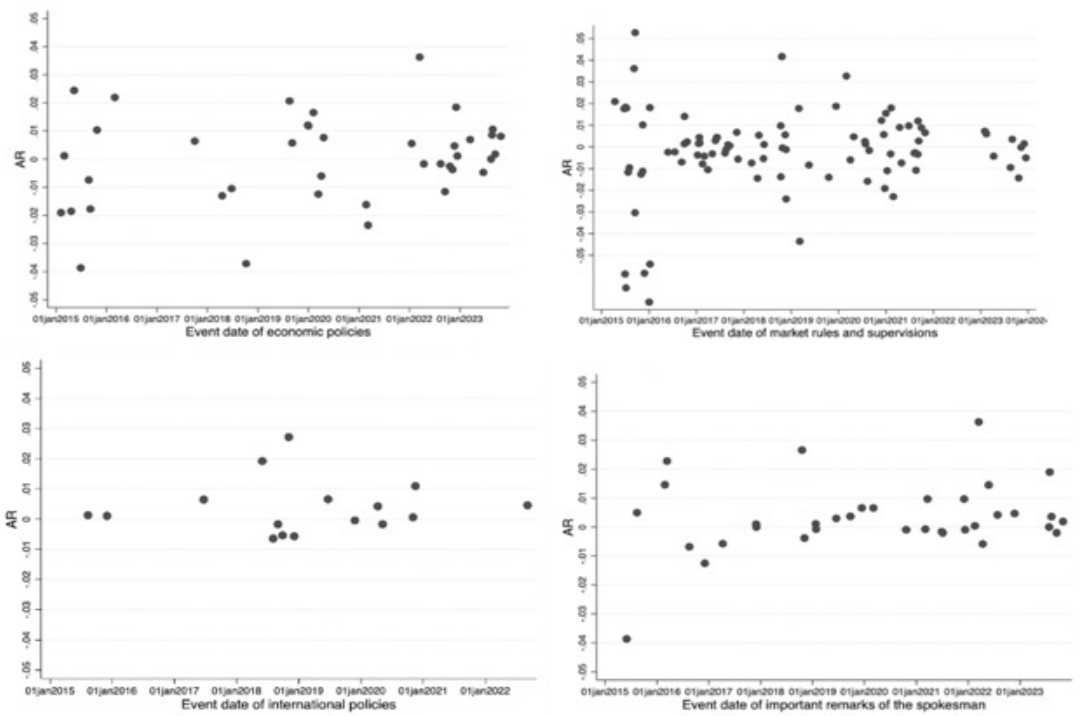

Figure 3 - Scatter Plots of Abnormal Returns of Various Policy Events from 2015 to 2023

Time Effect of Different Types of Policy Events

□1□ Economic Policy

Initially, there is a buildup of modest positive anticipation leading to the economic policy event, with an AR of 0.0478% five days before. This suggests that the market begins to react to the policy event approximately five days in advance. On the day of the event, the impact appears immediate and slightly positive, with an AR of 0.0133%, indicating that the event day itself has a mild influence on the market. In the days following the event, the CAR takes a dip and then shows a significant upturn. The AR increases to 0.0780% after five days, then significantly spikes to 0.5887% by the tenth day, marking a strong response from the market as it assimilates the policy implications. The pronounced impact thus lasts about 10 days after the event. However, by the twentieth day, the AR diminishes to 0.0844%. By the fortieth day, while still positive, the AR lessened to 0.1916%. This suggests that the most acute phase of market reaction, which reflects substantial volatility, lasts approximately 10 to 20 days after the event. Beyond this point, the market begins to demonstrate signs and signals of absorbing the policy's implications, with market fluctuations becoming less extreme and gradually returning to the usual volatility pattern.

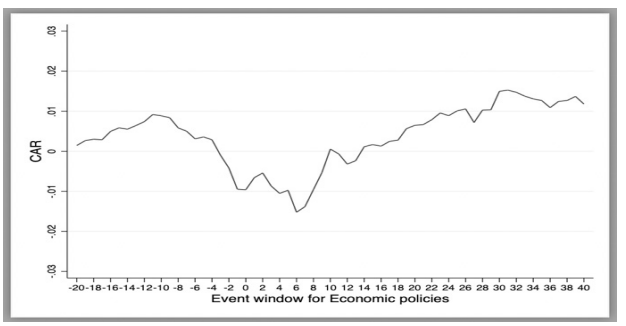

Figure 4 - The Average CAR of Economic Policy Events

Table 3 - The Average AR of Economic Policy Events at Specific Points in the Event Window

Window Period	AR(%)
[-5,-5]	0.0478
[0,0]	0.0133
[5,5]	0.0780
[10,10]	0.5887
[20,20]	0.0844
[40,40]	0.1916

□2□ Market Rule and Supervision

In terms of market rule and supervision policies, the analysis suggests that while the stock market begins to react approximately five days before the event, the adverse effects on market volatility extend well beyond the immediate aftermath, lasting around 40 days. The AR stands at -0.0832% five days before the event, signaling that the market begins to react to the potential adverse effects of the upcoming regulatory event. This could be explained by the longer period required during the formulation of policies such as laws, regulations, and institutional frameworks. Furthermore, this preparation process requires the solicitation of opinions.

On the event day, the AR decreases to -0.2470%, marking a sharp decline as the event's actual details become known to the public. The subsequent days do not offer any respite, with the AR deepening to -02753% five days after the event and reaching -0.3186% by the tenth day. This intensification suggests that the immediate aftermath of the event is met with continued pessimism as the market digests the ramifications of the new regulations. Nonetheless, the longitudinal trend is noteworthy. While there is a slight improvement in the AR by the twentieth day, which possibly demonstrates a period of market adjustment, the negative returns deepen again by the fortieth day to -0.2565%. Integrating this with the CAR findings, which show a steady downward trajectory post-event, it becomes clear that the impact of market regulation events on stock volatility is profound and enduring[14].

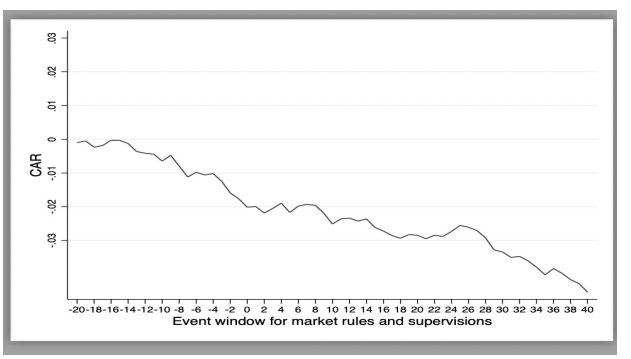

Figure 5 - The Average CAR of Market Rule and Supervision Events

Table 4 - The Average AR of Market Rule and Supervision Events at Specific Points in the Event Window

Window Period	AR(%)
[-5,-5]	-0.0832
[0,0]	-0.2470
[5,5]	-0.2753
[10,10]	-0.3186
[20,20]	-0.0204
[40,40]	-0.2565

□3□ International Policy

The trend reveals an initial surge in both AR and CAR, peaking just before the international policy event, indicating a general optimism about such events during early market reactions. On the day of the event, the AR remains positive at 0.3821%, suggesting that the initial impact of the event may align with or even achieve slightly better than investor expectations. However, the market

experiences a significant negative correction five days after the event and further decreases by the tenth day. This downward shift might reflect a reassessment of the event or a realization that the positive pre-event sentiments were overstated. The period of significant volatility appears to extend approximately 20 days post-event before the market begins to exhibit signs of recovery, indicating that the market might be adjusting to the new information.

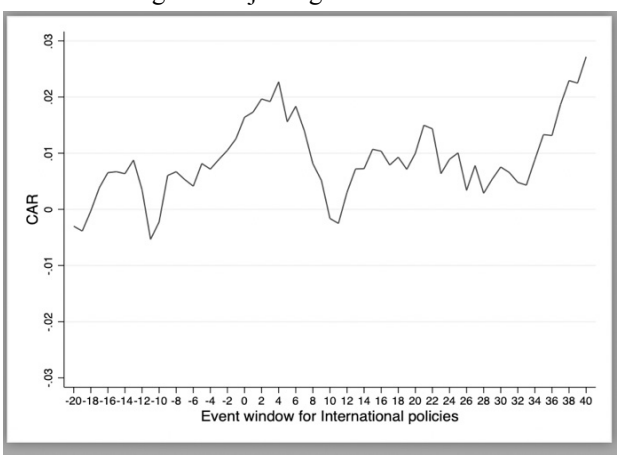

Figure 6 - The Average CAR of International Policy Events

Table 5 - The Average AR of International Policy Events at Specific Points in the Event Window

Window Period	AR(%)
[-5,-5]	0.4034
[0,0]	0.3821
[5,5]	-0.7125
[10,10]	-0.6785
[20,20]	0.2857
[40,40]	0.4689

□4□ Important Remarks of the Spokesman

The trend indicates an oscillatory but overall positive trajectory in CAR during the pre-event period, signifying a market that is cautiously optimistic or speculative about the upcoming speech made by the spokesperson. Immediately following the event, the CAR experienced a sharp decline in the following five days, suggesting that the content or implications of the speech may have caught investors by surprise, possibly triggering a negative reaction. However, the market quickly stabilizes and rebounds within the window period [5,20]. This recovery suggests an adjustment period where the initial shock is digested, as the market gradually begins to interpret the speech's content more favorably. Alternatively, initial concerns may be mitigated by additional information or subsequent positive developments that occur. Overall, it seems that the most significant positive impact of the policy events lasts for approximately 10 to 20 days after an event. After this period, the positive impact diminishes and the market gradually returns to normalcy.

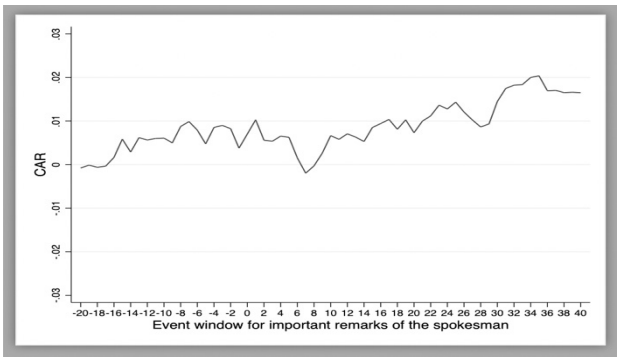

Figure 7 - The Average CAR of Important Remarks of the Spokesman Events

Table 6 - The Average AR of Important Remarks of the Spokesman Events at Specific Points in the Event Window

Window Period	AR(%)
[-5,-5]	-0.3152
[0,0]	0.3231
[5,5]	-0.0294
[10,10]	0.3984
[20,20]	-0.2962
[40,40]	-0.0010

Conclusion

Based on the classification of policy events in this article, market rule and regulation events occurred most frequently from 2015 to 2023, indicating the government's emphasis and resolve on market regulation and intervention. In recent years, the frequency of international policy events and economic policy events has shown an upward trend, which closely reflects the complex and changing circumstances occurring in the global landscape along with the escalation of trade disputes in recent years[15].

Generally, the volatility of economic policy events as well as market rule and supervision events have demonstrated a gradual decline over the years, which may be related to the frequent introduction and increased familiarity of these policies. However, the abnormal volatility caused by these policies remains the largest among the four types of policy events. On the other hand, important media remarks made by the spokesperson do not demonstrate a clear trend over the years, as the market's reaction to such policy events may depend on the specific content, context, and market conditions at the time of each speech. The stock market's reaction to international policy events remains closely interconnected to the prevailing international environment. This is evident by periods of intense fluctuations occurring around 2018, followed by a moderate volatility trend as the market could have potentially become more accustomed to the potential impacts of international policies on the global economic landscape.

In terms of the impact of economic policies on stock market volatility, the impact primarily concentrated within 10 days following the event, demonstrating a short-lived

impact on the market. This is then followed by media commentary events, which tend to be relatively enduring and apparent within 10 to 20 days. This could be explained by the diversity and complexity of media commentary, which requires a longer period to digest information from various sources to effectively assess the potential impacts, thereby adjusting investment strategies. In contrast, international policy events and market regulation events demonstrate longer-lasting impacts on the market. Such international policy events often involve the interests of multiple countries and regions with extensive and widespread effects, thus affecting the market for 20 to 30 days[16]. Market regulation events were found to take 30 to 40 days to fully manifest. This finding may also be understood through the direct relation of these events to the rules and order of market operations, affecting a wider group of stakeholders and entities. Additionally, the market often begins to react approximately 5 days before the occurrence of economic policy events, market regulation events, and international policy events. This reflects the market's sensitivity and foresight into policy changes, allowing investors to identify early signals of policy changes and adjust their investment strategies accordingly to cope with upcoming market changes.

Market operating principles play a fundamental and crucial role in the capital market. The government's primary responsibility is to address market failures. To achieve this goal, the government should focus on speeding up the establishment and improvement of market systems to ensure that the market can more effectively and fully exert its decisive role. Based on the above views, this article proposes the following policy recommendations. Since the impact of market regulation policies on the market is more controllable and sustainable due to the evolving market, market construction should be strengthened in the direction of market-oriented and legal rules[17]. Regarding the regulatory system of the Chinese stock market, there are still many issues such as institutional deficiencies and deviations in market function positioning. To ensure the healthy development of the stock market, policy guidance and control by regulatory authorities are of great significance. However, excessive policy intervention may also cause market fluctuations and reduce policy efficiency. Therefore, when implementing financial regulatory policies, regulatory authorities need to adhere to the principle of prudence to achieve smooth market operation and normal functioning[18]. Moreover, considering the market begins to react about 5 days before the occurrence of major policy events, the government could develop dynamic response mechanisms that allow for quicker adjustments to market rules and regulations based on real-time market data and trends, such as those utilized in the current paper. In turn, this would aid in stabilizing the market by promptly and effectively addressing issues that arise.

Acknowledgments

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Factors Affecting Borrower's Over-Indebtedness in Microfinance

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Abstract

Microfinance institutions were established in the country to enhance access to financing for impoverished individuals who are excluded from traditional financial institutions and to eliminate poverty. As a result, a vast number of microfinance organizations have sprung up, giving the impoverished better access to capital. However, it can lead to over-indebtedness, which should be treated seriously, especially since customer protection and social safety nets are lacking in many of the nations where microfinance operates. This is why microfinance organizations have an even greater obligation to safeguard their customers. These organizations have a social goal to help their consumers improve their lives by responsibly providing financial services. This study aims to explore the existence of overindebtedness in microfinance clients in Koshi Province in Nepal. In addition, the study aims to examine the factors related to over-indebtedness. The study considered 150 samples of micro-borrowers in province one, in which 98 micro-borrowers' responses were collected. It was found that the micro-borrowers in Koshi province experienced over-indebtedness. It has emerged that the increased access to finance has led to the prevalence of over-indebtedness among micro-borrowers in the region. The urban micro-borrowers are over-indebted in comparison to rural micro-borrowers. It was found that debt-to-income ratio and multiple borrowings are the prominent factors affecting the over-indebtedness in micro-borrowers. It can be concluded that over-indebtedness is one of the major risks for the microfinance industry, regulators and investors should understand the need for customer protection that goes beyond ensuring stable financial institutions. In general, the microfinance industry should measure customer satisfaction and impact as a standard management tool and place the same importance on these factors as it places on economic indicators.

Keywords: *Micro-finance, over-indebtedness, micro-borrowers*

Speech Analysis of Defense Attorney Based on Neural Responses

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Abstract

The language skills of defense attorneys have important impacts on the judgment of the jury. However, the emotional and cognitive effects caused by the above impacts are closely related to the subconscious activities of the brain, which are difficult to be evaluated comprehensively and accurately through a subjective self-report way. This study aims to explore an effective method to analyze the psychological effects of defense attorney's speeches based on the audience's neural responses. Through the computation of the neural activity data while the subjects watch courtroom arguments, this study proposes a promising new approach for analyzing and assessing the attorney's language skills.

Keywords: *Defense Attorney, Language Skills, Speech Analysis, Neural Response*

Introduction

Courtroom argument is the vital part of the trial process, its language skills have important impacts on the cognition and adjudication of the trialed case, and have attracted the common interest and attention as an interdisciplinary research domain of law, linguistics, and psychology [1, 2]. Crucially, the attorneys need to utilize various logic and emotional expression skills according to the designed defense strategies, to guide the cognitions of the trial personnel and persuade them to make the judgmental decisions in favor of their clients [3-5]. Besides, the criterion as to whether justice is fulfilled had to consider the usual judgements of ordinary people, especially in most western countries which have a jury system. The jury represents the consensus of the society or a local social community, not the thinking of legal professionals. Therefore, the courtroom arguments should be presented and accepted in the light of the cognition and judgment of the public. Conley et al. analyzed the impact of changes in the presentational style of courtroom language on the decision makers [4]. Hahn and Clayton evaluated the effect of attorneys' narrative style and gender on decisions of the jury [5]. They all concluded that the excellent language skills of the attorneys play an important role subtly in striving for acquittals for their clients.

As for the language skills in courtroom arguments, the language act theory and pragmatic studies regard it as an issue of linguistic psychological effects, which are caused by the following features embedded in the argument speeches: legal compliance, logical validity, and psychological effects [6,7]. Hu expounded the legal compliance from five perspectives of jurisprudential norms, discourse power norms, procedural norms, evidentiary norms, and debating norms [6]. Shalmanova and Shumov made a further study on the precision problem of court language [8]. Based on the corpus analysis of approximately 1000 sentences extracted from the case records of the US Supreme Court, Liu investigated the lawyers' arguments from the perspective of linguistic communication dynamics, and revealed the language logic and the characteristics of the emotional expression [9]. Yu analyzed the factors affecting the acceptance of courtroom arguments from the viewpoint of legal thinking and logical methodology, and emphasized the roles of situational cognition and persuasive utility under the above specific contexts [8]. This utility can be understood as the resulting valence of psychological effects for the trial personnel or the public.

The psychological effects caused by languages usually include cognitive and emotional aspects dominated by human brain mechanism [10], which have mutual influence and involve a series of descriptive indicators. However, this study mainly focuses on the three indicators of attention intensity, cognitive load, and emotional change, which are of great significance to the analysis

of language skills under the scenarios of courtroom arguments. Attention intensity usually reflects how much attention is paid to the speeches presented by the arguer, cognitive load represents how easy it is for the listener to understand what is being said by the arguer, and emotional change indicates how emotionally affected the listener is by the arguer's speeches [11-13]. The induced psychological effects by speeches are closely pertinent to the brain's subconscious perception, which are difficult to be described and expressed in subjective narration at the state of consciousness [13,14]. In recent years, the development of experimental observation techniques in neuroscience such as electroencephalography (EEG) has made it possible to observe the brain neural activity in the subconscious or even unconscious state, thereby providing a more accurate and effective approach for analyzing the psychological effects [15]. This study aims to explore the method for psychological effect analysis of the attorney's speeches based on EEG signals.

Data Acquisition and Preprocessing

In the experiment, a total of 22 qualified subjects (10 males and 12 females) aged between 18 and 55 were selected as members of a mock jury or public representatives. Among them, 12 were undergraduate and graduate students while the remaining 10 were teachers and employees of government agencies and companies. Further, three had a background in legal profession, 8 in humanities and social sciences, 6 in engineering and technology, and 5 in mathematics, physics, and medical science. Prior to the experiment, each subject was fully informed on the experimental purpose, process, and potential impacts on human body in accordance with the ethical norms, and signed an informed consent form.

In order to avoid the influence of the subjects' preconceptions about the case and characters, the courtroom argument scenarios extracted from the famous movie "And Justice for All" and the television series "American Crime Story: The People v. O.J. Simpson" were used as the test materials in the study.

The experiment used a specially designed computer control system for EEG testing, which can collect the data from the 10-20 standard lead EEG device according to the following experimental procedure.

Stage 1: Preparation for testing. Put on the electrode cap for the subject and debug the EEG device; prepare the subjects in the resting and calm state while the control computer sends the instruction to begin the test.

Stage 2: Resting-state data acquisition. Start the EEG to record the resting-state brain electrical signals, and to transmit the data to the control computer in which a special software reads and stores them in the database.

Stage 3: Synchronous data acquisition. The control computer issues the EEG testing instructions, which is then conditioned by the synchronous measurement and control unit. The output signals are sent out and the variation of the EEG signal is recorded and transmitted to the control computer for storage. In the meanwhile, the psychological effects of the attorneys' speeches were evaluated by the subjects and the results are stored in the database.

Stage 4: Test completion. The control computer sends out instructions to complete the test and to restore the device to its initial state.

During the playback of the test materials, we collected 18 paragraphs of EEG signals containing only the attorneys' speeches through computer synchronous control, as shown in Table 1.

Table 1 – The Sample Data of Collected EEG Signals

1	ev	mi	se	c1	c2	c3	c4	c5	c6	c7	c8	bs
2	1	.061	3.633	3.269	71.682	-45.647	.676	20.287	-29.755	-52.071	-36.517	-738.123
3	1	.061	3.641	-29.642	40.575	-57.819	-7.777	14.877	-25.021	-33.812	-29.417	-738.123
4	1	.061	3.648	13.863	82.164	-14.539	35.165	54.438	16.568	-15.892	-40.237	-738.123
5	1	.061	3.656	-8.228	44.632	-42.942	-7.101	1.352	-29.079	-45.647	-32.122	-738.123
6	1	.061	3.664	-15.441	25.359	-20.964	13.863	35.165	13.525	1.014	-29.755	-738.123
7	1	.061	3.672	18.146	29.079	13.525	5.748	35.503	-11.158	-7.777	-31.445	-738.123
8	1	.061	3.68	-32.347	-32.122	-28.402	-42.265	-14.877	-41.589	-22.654	-24.683	-738.123
9	1	.061	3.688	-7.551	17.244	-3.381	27.388	29.755	33.812	4.396	-1.691	-738.123
10	1	.062	3.695	-12.511	18.259	-25.359	6.424	-20.626	-8.453	-39.899	6.086	-738.123
11	1	.062	3.703	-44.858	-21.64	-35.503	.676	-19.611	4.396	-10.82	1.691	-738.123
12	1	.062	3.711	3.607	8.115	15.554	27.388	19.611	15.554	15.554	17.244	-738.123
13	1	.062	3.719	-24.683	-45.309	-15.892	-36.517	-30.769	-42.942	-6.086	-8.791	-738.123
14	1	.062	3.727	-13.525	-32.798	-3.043	0	4.396	7.439	26.036	-7.777	-738.123
15	1	.062	3.734	10.482	-4.734	-5.748	11.158	-20.626	-6.762	-13.187	18.597	-738.123
16	1	.062	3.742	-43.167	-34.827	-44.632	-6.762	-55.452	-14.201	-25.697	-4.057	-738.123
17	1	.062	3.75	-10.144	-2.367	-.676	16.906	-8.115	17.244	1.352	16.23	-738.123
18	1	.063	3.758	-7.213	-25.021	-13.187	-25.697	-40.575	-23.669	-20.964	16.23	-738.123
19	1	.063	3.766	-20.738	-26.712	-22.654	-34.15	-32.798	5.748	-4.734	.338	-738.123
20	1	.063	3.773	5.523	-4.734	-1.691	-53.085	-18.935	-3.719	-1.691	27.726	-738.123
21	1	.063	3.781	-6.875	-36.517	-7.439	-83.178	-27.05	-26.036	5.072	-8.453	-738.123
22	1	.063	3.789	7.89	-27.726	10.482	-51.395	.338	-5.072	20.626	-17.921	-738.123
23	1	.063	3.797	3.945	-39.899	-1.014	-64.243	-25.697	-27.05	2.705	6.424	-738.123
24	1	.063	3.805	-7.89	-39.899	-2.029	-48.014	-20.626	.338	15.554	-19.273	-738.123
25	1	.064	3.813	6.537	-40.575	12.849	-49.704	-22.654	-15.892	17.244	.338	-738.123
26	1	.064	3.82	-2.254	-75.063	17.244	-62.891	-24.683	-24.007	32.122	6.424	-738.123
27	1	.064	3.828	19.048	-63.567	45.309	-31.784	8.453	-9.129	46.323	-14.877	-738.123

The EEG signals can be processed by means of wavelet decomposition and reconstruction to yield typical brain wave frequencies such as δ (0.5-3Hz), θ (4-7Hz), α (8-13Hz), β (14-30Hz), and γ (>30Hz). Among them, the θ and α waves are mostly linked to the brain's subconscious and unconscious states. In order to get more accurate computation results by machine learning, we divided the signals into the following nine subdivided bands: δ (0.5-3Hz), θ (4-7Hz), low α (8-10Hz), high α (11-13Hz), low β (14-15Hz), midrange β (16-20Hz), high β (21-30Hz), low γ (31-40Hz), and midrange γ (41-50Hz). The EEG signals were pre-processed by filtering and wavelet transform to obtain the energy values of each subdivided band for the subsequent machine learning.

Machine Learning Method

Learning model

The CNN-LSTM model combines with the advantages of LSTM (Long Short-Term Memory) model and CNN (Convolutional Neural Networks) model, which has been successfully applied to the emotion recognition from EEG signals in recent years [30]. Therefore, we design the CNN-LSTM model architecture and employ it for the correlation assessment between EGG signals and the psychological effects as shown in Figure 1.

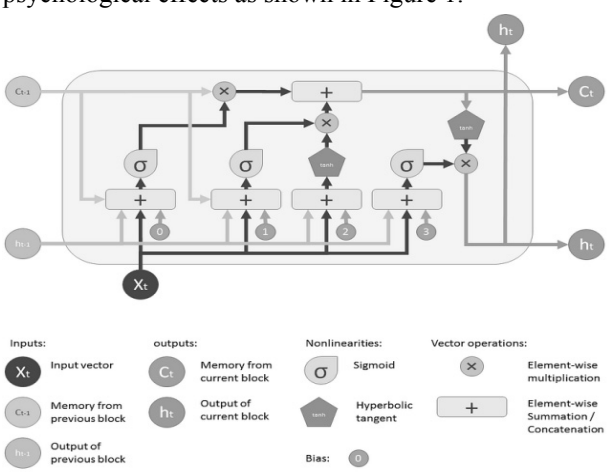

Figure 1 – LSTM Built Block

The model consists two CNN layers, a one-layer LSTM network and a full connected layer as shown in Figure 2. A dam optimizer together with a learning rate of 0.001 which would be divided by 2 in every 15 epochs is applied. The architecture is programmed in Pytorch. All the figures are trained in a batch size of 2.

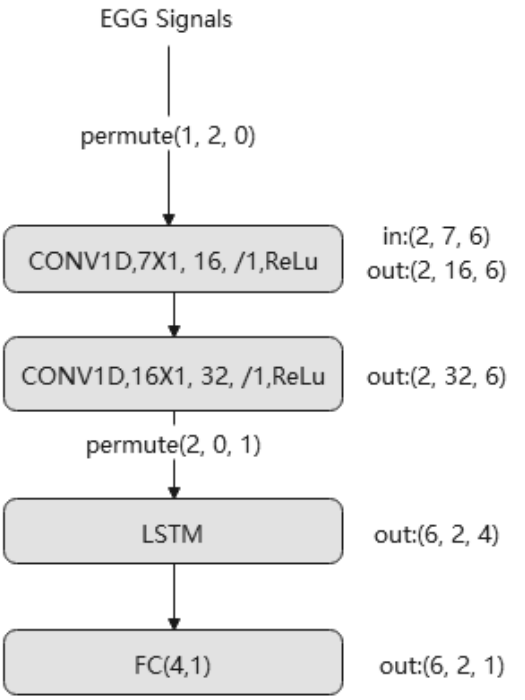

Figure 2 – Model Architecture

Training and evaluation

The model for three output psychological effect indicators, namely attention intensity, cognitive load, and emotional change, are trained respectively. The learning performances are evaluated by a MAPE (Mean Absolute Percentage Error) curve. The CNN-LSTM model performances of attention intensity, cognitive load, and emotional change are shown in Figure 3, Figure 4, and Figure 5 respectively.

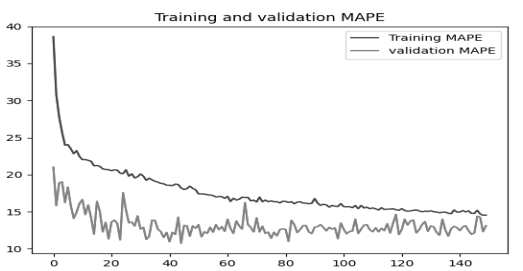

Figure 3 – MAPE Curve of Attention Intensity

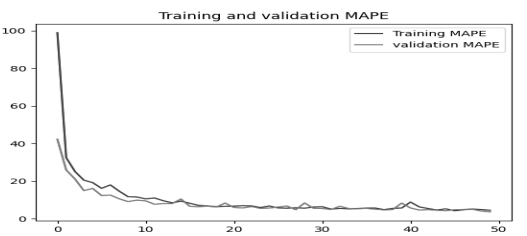

Figure 4 – MAPE Curve of Cognitive Load

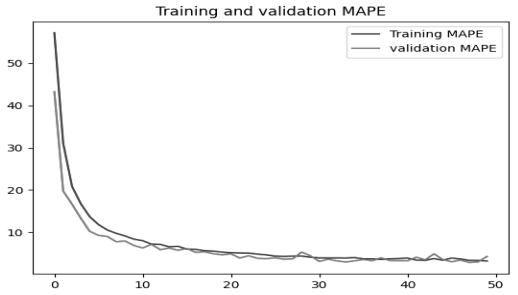

Figure 5 – MAPE Curve of Emotional Change

The final trained MAPEs of CNN-LSTM model, CNN model, and LSTM model are shown contrastively in Table 2. As seen from Table 2, the CNN-LSTM model can achieve more higher accuracy than a single CNN model or LSTM model, which provides an appropriate and valid approach for the continuous and dynamic computation of psychological effects from EEG data.

Table 2 – Final Trained MAPEs of Different Model Structures

Model Name	MAPE		
	Attention intensity	Cognitive load	Emotional changes
CNN-LSTM	7.802%	3.188%	14.544%
CNN	22.672%	9.387%	41.053%
LSTM	9.411%	4.123%	20.134%

Psychological Effect Analysis

The US courts deal with cases mostly in adversarial proceedings, for which the main idea is that the court relies on the evidence presented by the litigation parties to develop the judgement. The main speech roles in the courtroom include the judge, the prosecutor, the attorneys, the witnesses, and the defendant. In criminal cases, the prosecutor and the attorneys participate in the proceedings as agents for the state and the defendant, respectively. In the common law jury trial, the jurors act as the fact finders and decide whether the defendant is guilty or not. If found guilty, further sentencing is to be made by the judge who is required to assume the role of presiding over the entire case.

In order to illustrate how the attorneys' linguistic skills would affect the psychology of the jury (or the public), this paper takes the famous Simpson case as the example. Two audio clips were extracted from the attorneys' speeches in the television series of "American Crime Story: The people v. O.J. Simpson", and were used as the source material for analysis. The three indicators of the psychological effects (attention intensity, cognitive load, and emotion change) on the mock jury (or the public) were determined based on the obtained EEG data.

Segment 1: The interrogation conversation between the defense attorney F. Lee Bailey and the prosecuting witness Detective Mark Fuhrman regarding whether he had utilized the term "nigger."

The attorney's speeches: I will ask a different question. In describing people, Detective Fuhrman, do you use the word "Nigger"? Detective Fuhrman, have you ever used the word "nigger" when addressing someone? // Have you ever used the word "Nigger" in the past ten years? // You mean if you called someone a nigger, you have forgotten it? // Let me put it simply. Are you saying, under oath, that you have not addressed any black person as a nigger

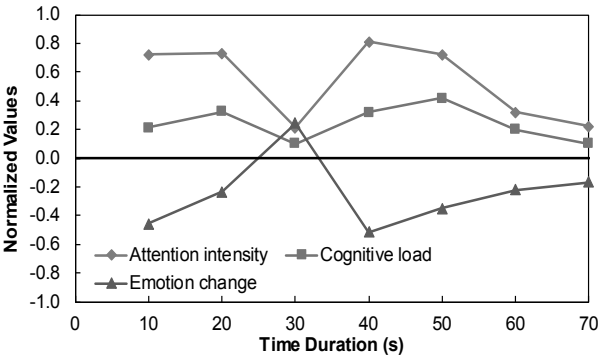

Figure 6 – Psychological Effects of the Attorney's Speeches in Segment 1

Language skills: The attorney threw out four consecutive rhetorical questions to induce the witness to make an affirmative and clear statement that he never used the word "nigger". The purpose of these questions was not to create confusion, but to set the stage for subsequent testimony that Fuhrman frequently used insulting words such as "nigger," thereby arousing the jury's or the public's distrust on him and rendering his testimony ineffective. As shown in Figure 8, the attention density of the mock jury (or the public members) was at a high level, the cognitive load was moderate, and the emotion change varied in the negative region, indicating that the attorney's questions triggered a high degree of attention and formed negative perceptions with relative ease. In short, his linguistic skills produced highly desirable results.

Segment 2: The defense attorney Barry Scheck questioned the criminal examination expert Dennis Fung on the key evidence of blood and hair.

The Attorney's Speeches: Mr. Fung, you received from Detective Lange, the blood sample taken from Mr. Simpson, correct? // And where did you take possession of that blood sample? // Well, maybe I can help. The blood was handed to you at the Rockingham scene while you were examining that scene, correct? // So, Mr. Simpson's blood was literally handed to you by LAPD at the very location where you found evidence of his blood on the carpet in the driveway, in his socks? // This might explain a huge unanswered question in this case. Are you aware, sir, that 1.9 milliliters or one quarter of the blood collected

from Mr. Simpson is missing?! // Mr. Fung, when did you realize that the blanket covering Nicole Brown's body was actually from inside her own residence? // Would you agree, sir, that a blanket taken from inside her residence placed by law enforcement over her dead body could be thought of as a contamination of that scene? // And that if Mr. Simpson had been in that home previously, sitting or lying on that blanket, his hairs could be on that blanket? Would be on that blanket? And thus, would have been in the crime scene? // That is a terrible mistake for a criminalist to make. Isn't it? // Mr. Fung, have you made some bad choices in this case? // No further questions.

Psychological effects: As shown in Figure 7.

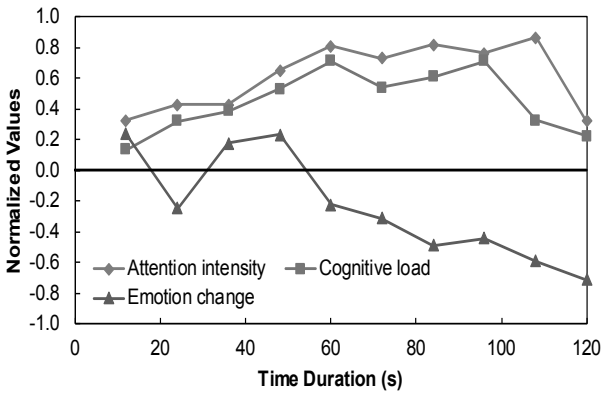

Figure 7 – Psychological Effects of the Attorney's Speeches in Segment 2

Language skills: The attorney used a barrage of questions that caused the witness to gradually begin to doubt the legitimacy of the evidence. Stammering and ambiguous in his answers, the expert witness not only was interrupted several times by the attorney, but also agreed that "that is a terrible mistake for a criminalist to make." Using quick and frequent questioning, the attorney effectively consolidated his dominant voice and controlled the direction of the whole conversation, making the jury (or the public) naturally doubt the credibility of the procurators' key evidences. According to Figure 9, the attention density of the mock jury (or the public members) was always at a high level, indicating that the attorney's questions had triggered a high level of attention. The cognitive load level was also high, suggesting that the questions had prompted a deep thinking. The overall rapid reduction of emotion changes into the negative region reflected that the jurors (or the public) had developed strong doubts and dissatisfaction. In short, the attorney's language skills were again highly successful in producing the desired effects.

Summary and Discussion

the attorney's speeches in court arguments can produce subtle emotional and cognitive effects on the jurors, and significantly affect their judgment. Those psychological effects are closely related to the subconscious activities of the brain, and difficult to be reflected in a subjective self-report way. This study used the courtroom attorneys' speeches extracted from movies and television series as the source materials, and proposed a promising new approach for analyzing and assessing the attorney's language skills based on the computation of the audience's neural response data.

In real trials, the courtroom arguments are conducted in the form of dialogues between two or more parties with complex contexts and involving multi-faceted expertise. Therefore, further exploration is needed in the accurate extraction of EEG signals and on the cognitive discrepancies between the jury or the public members with different genders and professional backgrounds. In addition, the neural mechanisms underlying these psychological effects have yet to be systematically investigated in conjunction with various neuro-experimental equipment such as functional magnetic resonance imaging (fMRI) and event-related potentials (ERPs).

Acknowledgments

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Emotıonal Bonds and Ratıonal Mınds: How Anthropomorphısm and Intellıgence Shape Trust in AI Adoptıon

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Abstract

Generative artificial intelligence (AI), like ChatGPT, has revolutionized industries such as customer service, healthcare, finance, and entertainment by moving beyond traditional analytical tasks to creative content generation. This shift has broadened AI's business applications, including customer service enhancements, marketing content creation, and operational streamlining. However, integrating AI presents challenges, notably in establishing user trust. Trust in AI involves both cognitive trust, based on perceived competence and reliability, and affective trust, rooted in emotional connections. Factors such as anthropomorphism and perceived intelligence can either enhance or undermine trust. Effective AI system design must balance these elements to foster user adoption and reliance.

Keywords*: Generative AI, Trust, Anthropomorphism, Decision-making, Adoption*

Introductıon

The rapid advancement of generative artificial intelligence (AI) technologies has transformed various industries, including customer service, healthcare, finance, and entertainment. Previously, AI was mainly recognized for its analytical capabilities, suited for decision-making tasks. Now, AI has transformed into Generative AI with the ability to perform generative tasks, making it suitable for content creation. While content creation can still be considered analytical due to its probabilistic nature, the results can be creative or even artistic as generative AI combines elements in novel ways (Feuerriegel et al., 2024)

Generative AI, such as ChatGPT, offers numerous applications for businesses across various domains. For instance, it can be deployed as a chatbot to enhance customer service, assist customers in task completion as a virtual assistant, streamline accounting and HR functions, and create marketing content such as advertisements and campaign ideas (Fui-Hoon Nah et al, 2023). Thus, the scope for using Generative AI in business is expansive and continually growing. Generative AI has brought new possibilities and challenges. Specifically, ChatGPT can deliver a large amount of data in a structured and logical way, enabling individuals to filter and organize various options. By providing natural language search capabilities, it allows decision-makers to easily obtain the information they need (Feuerriegel et al., 2024).

A recent study investigated the impact of ChatGPT's recommendation quality and ethical concerns on travelers' acceptance, satisfaction, and perceived trustworthiness. The results showed that when quality and ethical concerns were prominent, acceptance of and satisfaction with ChatGPT's recommendations decreased significantly, with the negative effects mediated by perceived trustworthiness [4]. Furthermore, a recent behavioral experiment investigated this by allowing subjects to use an ML-based decision support tool for text classification. The experiment varied the information subjects received and found that transparency could negatively impact trust. Hence, these findings have significant implications for decision-makers employing AI technology [5].

As these AI applications become increasingly integrated into daily life, understanding the factors that influence user trust in AI is critical. Trust is a complex, multidimensional latent variable that bridges past experiences and a user's decision to depend on the AI system in uncertain situations. This construct plays a crucial role in the acceptance and utilization of AI systems [6].

There are two main components of trust that significantly influence the individual adoption of generative AI: cognitive trust and affective trust. Cognitive trust is grounded in a rational process where users evaluate the trustworthiness of AI based on its perceived competence, ability, and integrity (Khaksari & Keyvanpour, 2019; Kraus et al., 2021; Shi et al., 2021). This form of trust is influenced by the reputation of the service provider and the perceived role of the AI in delivering services (Khaksari & Keyvanpour, 2019). Users assess the reliability of AI through a cognitive process, considering evidence and recommendations from others to form trust judgments (Lewis & Weigert, 1985). Cognitive trust is therefore based on an individual's rational calculation of the potential benefits and risks associated with the use of AI (Gillath et al., 2021; Glikson & Woolley, 2020).

In contrast, affective trust is rooted in the emotional connections users form with AI. This type of trust is based on the user's psychological disposition, feelings, and attitudes towards AI (Gillath et al., 2021; Glikson & Woolley, 2020; Shi et al., 2021). Unlike cognitive trust, affective trust is often irrational and influenced by an individual's propensity to trust others and their emotional investment in the trust relationship (Pennings & Woiceshyn, 1987; Rempel, Holmes, & Zanna, 1985; McAllister, 1995). Affective trust can lead users to make decisions based on their psychological background, sometimes ignoring factual information about the AI and its providers.

Anthropomorphism and perceived intelligence are two critical factors that affect both cognitive and affective trust in AI. Anthropomorphism, the attribution of human-like characteristics to AI, enhances users' social presence and emotional connection with the technology, thereby fostering affective trust (Glikson & Woolley, 2020). Users tend to develop parasocial relationships with anthropomorphized AI, similar to the connections they form with fictional characters, which can motivate continued use and trust in the application (Glikson & Woolley, 2020). However, excessive anthropomorphism can sometimes lead to discomfort and reduce trust if users feel the AI is too human-like or intrusive (Huang & Rust, 2018).

The perceived intelligence of AI also plays a significant role in trust formation. AI applications demonstrating high levels of intelligence, such as those capable of complex problem-solving or empathic interactions, can enhance cognitive trust by showcasing their competence and reliability (Huang & Rust, 2018). However, when AI behaves unpredictably or its actions are difficult to understand, users may experience unease, which can undermine trust (Huang & Rust, 2018). The dual nature of AI's perceived intelligence—both as a strength and a potential source of discomfort—highlights the need for careful design and communication to balance these effects and foster trust.

CONCLUSIONS

In summary, the adoption of generative AI is heavily influenced by cognitive and affective trust, with anthropomorphism and perceived intelligence being key factors. While anthropomorphism can strengthen emotional bonds and affective trust, it must be managed to avoid discomfort. Similarly, the perceived intelligence of AI can enhance cognitive trust if it demonstrates competence and reliability, but can also reduce trust if it leads to user unease. Understanding these dynamics is crucial for developing AI applications that are both trusted and widely adopted.

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Assessing the AI Adoption Readiness in Humanitarian Supply Chain Management (Relief supply chain): an Indian Perspective

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Abstract

Organizations worldwide are ready to adopt AI in their operations to minimize disruptions. However, very few are reaping its benefits. This is due to the lack of practical understanding of their readiness to adopt these technologies beforehand. They lack an evaluation of their present state of readiness before adoption. This study aims to assess AI adoption readiness in humanitarian settings. This paper enhances our understanding of AI readiness and adoption by analyzing detailed factors influencing AI readiness. This model is tested by considering a humanitarian organization to get the full purview of practical implications. This model provides the weaker factor based on FPII values. Focusing on these factors is essential for improving AI adoption readiness in organizations. We also identify strategic components that can assist humanitarian organizations in managing the AI adoption process more effectively. We used a fuzzy logic approach to achieve this, collecting data from the core team working on the relief supply chain, having expertise in IT, AI, and other state-of-the-art technologies. Our findings provide valuable insights for research and practical applications in understanding AI technological readiness. The developed readiness model will help researchers, policymakers, and government organizations understand the mechanisms of assessing AI adoption, which can also be extended to other fields.

Keywords: *Humanitarian Supply chain, Fuzzy logic, Artificial intelligence, AI readiness index.*

Application of Artificial Intelligence (AI) in HR

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Abstract

This study explores the impact of Artificial Intelligence (AI) integration in Human Resource (HR) practices amid rapid technological advancements reshaping organizational management and HR processes. Despite technological investments fostering agile decision-making, HR functions lag behind in adopting digital transformations compared to other business domains. A survey disparity underscores HR's lower analytics adoption rates, hindering data-driven culture development and HR's strategic influence. The COVID-19 pandemic accentuates HR's need for digital maturity to align talent strategies with business goals through AI tools. Opportunities exist to enhance HR efficiency via AI, contingent upon improving data literacy and technology skills among HR professionals. HR analytics' pivotal role in shifting decision-making to data-driven methodologies enhances organizational competitiveness and effectiveness, emphasizing proactive HR management. The study synthesizes literature and case studies reviewing published articles to illustrate AI's transformative potential in HR, highlighting strategic barriers and benefits for organizational success.

Keywords: *Artificial Intelligence (AI), Human resource management, HR Analytics, Data-Driven HR, Digital Transformation, Workforce Management*

Background

Technological advancements have significantly altered how organizations manage their workforce, attract talent, and streamline HR processes. Despite these changes, many HR practices still reflect outdated talent management models that were effective when business leaders operated with longer planning horizons and faced more predictable labor markets. Today's businesses confront rapid change and disruption, prompting investments in flexible technologies that enable agile planning and decision-making. However, HR functions have been slower to embrace digital and data-driven transformations compared to other business areas, limiting their strategic impact.

A survey conducted in 2014 highlighted a stark contrast in analytics adoption rates between HR (14%) and other functions such as finance (81%), operations (77%), sales (58%), and marketing (56%) (Deloitte, 2014). Recent studies continue to reveal challenges in fostering a data-driven culture within HR, with only 42% of companies reporting readiness in this regard (Insight, 2022). Lack of data-driven skills within HR teams remains a significant barrier to achieving people analytics maturity (Visier, 2023).

The COVID-19 pandemic has underscored the imperative for HR functions to embrace digital practices and accelerate technological maturity to effectively align talent strategies with business transformation objectives. By prioritizing digital tools like AI, HR can position itself as a strategic enabler within organizations, necessitating close collaboration between HR and total rewards (TR) leaders and colleagues from diverse backgrounds.

As technology continues to evolve, HR professionals have opportunities to enhance efficiency through the adoption of emerging technologies like AI. However, realizing these benefits requires significant upskilling in data and technology literacy to effectively integrate these tools into HR operations.

In today's digital era, the role of HR analytics is pivotal in transforming decision-making from subjective, intuition-based approaches to data-driven methodologies. By analyzing HR, financial, and operational data, HR analytics enable organizations to derive insights that drive business performance (Visier, 2023). This shift towards proactive HR management enhances organizational effectiveness and competitiveness by anticipating future trends and challenges.

Overall, the evolution towards sophisticated HR analytics represents a fundamental shift from traditional HR practices to predictive analytics, empowering HR to play a strategic role in achieving organizational success.

Besides, the advent of big data and advanced analytics has revolutionized various business domains, including Human Resources (HR). HR analytics, the application of data analysis techniques to HR data, enables organizations to make informed decisions regarding workforce management. This transition from traditional HR metrics to sophisticated analytics has significant implications for organizational effectiveness and competitiveness

Historically, HRM relied heavily on intuition, experience, and basic reporting. These methods, while useful, often lacked the predictive power necessary to anticipate future trends and challenges. The development of HR analytics has allowed organizations to transition from reactive to proactive HR management, thereby enhancing their ability to achieve strategic goals

Research Questions

The researcher wants to infer how Artificial Intelligence(AI) is integrated in HR practices recently.

Objectives

This article tracesthe Integration of AI in HR Practices. Also, identifies thebarriers to Data-Driven HR Transformation and assesses the Strategic Impact of HR Analytics.

Methods

The article reviews the literature on the integration of Artificial Intelligence (AI) in Human Resources (HR) practices, highlighting the models and strategies that have been successfully implemented by leading organizations worldwide. Insights are drawn from various studies and reports to understand the current state of AI adoption in HR and the barriers to its widespread implementation. Secondary data sources, including peer-reviewed journals, industry reports, and case studies, are utilized to provide a comprehensive overview of the topic.

Review of Literature

Strategic HR Analytics: Key Success Criteria

For the effective deployment of strategic HR analytics, several essential criteria must be met. First, the HR department must have the necessary knowledge and skills to gather pertinent data, conduct appropriate statistical analyses, and convey the results effectively. Key skills required include data analysis, multivariate modeling, root cause analysis, research design, survey design, and quantitative data collection and analysis. Many HR professionals lack the expertise to formulate the right questions about the HR data available to them, making it more practical to teach business analytics professionals HR concepts than to train HR professionals in statistics and analytics. The challenge of asking the right questions is further complicated by insufficient data. HR analytics demands professionals with IT knowledge (to operate analytics software) and financial skills (to understand and use business metrics).

Training HR analytics teams in areas such as analytical thinking, business analytics, statistics, data collection, reporting, analytical tools, effective communication, business and financial acumen, strategic and tactical planning, and storytelling is vital. Instead of starting with available data, HR analytics teams should focus on business challenges to derive new insights. Data stored in various unconnected silos creates difficulties in combining information from different parts of the organization.

HR professionals need access to cross-functional organizational data to perform their analyses effectively. Other departments must be willing to provide access and participate in the process. Successful HR analytics programs require the support of senior executives, IT resources and technical support, and strong, business-oriented leadership. Implementing HR analytics involves overcoming resistance to change and shifting from intuition-based decision-making to data-driven approaches.

The Promise of AI

The HR and TR functions are responsible for developing strategies, structures, and processes that significantly impact an organization's culture and mindset. They typically manage substantial amounts of employee data. The potential of generative AI in managing and interpreting vast amounts of employee and organizational information can dramatically transform the HR function. Until now, AI has primarily been used to improve efficiency by handling repetitive, time-consuming tasks. However, future advancements in AI could enable more profound, data-driven solutions from the HR function, going beyond mere automation and simplification of routine tasks.

New generative AI models and tools are designed to integrate and learn from large volumes of data from various sources, which all employees can utilize. Previously, experimenting with AI was limited to computer and data scientists with deep knowledge of coding and statistical principles. The recent wave of generative AI tools has democratized AI technology across all industries, skills, and use cases. For example, ChatGPT quickly became one of the most widely adopted products in history, with over 100 million users just two months after its launch (Leonardi, 2023).

This widespread adoption and low barrier to entry have made advanced data tools accessible to HR teams and average employees. Surveys indicate that data literacy and digital proficiency are among the least common competencies among HR professionals (Van Vulpen, 2024). Yet, 81% of HR leaders report implementing or exploring generative AI solutions in their organizations (Gartner, 2023). Generative AI tools offer the opportunity to enhance skills and abilities by automating low-value administrative tasks and data analysis, allowing subject-matter experts to focus on higher-value activities such as interpretation, problem-solving, and business consultation.

HR analytics involves generating and using evidence by analyzing data and identifying patterns to improve decision-making regarding human resources. Utilizing HR analytics can provide insights into the effectiveness of HR activities, enabling organizations to make necessary improvements. HR analytics can offer various insights into how HR initiatives contribute to operational goals and strategies, such as identifying patterns in employee turnover, expected performance levels from new hires, employees likely to leave within a specified period, required compensation and benefits plans to reduce turnover, and necessary training investments for employee productivity. Employing HR analytics can transform HR operations, provide new insights, and allow HR to contribute meaningfully to business performance. The global HR analytics market is projected to grow at a compound annual growth rate (CAGR) of 12.8% from 2019 to 2027 (Credence, 2019). The role of HR analytics manager ranks second among the 25 fastest-growing jobs in the United States, with salaries ranging from $41,000 to $122,000, equally split between male and female job holders (LinkedIn, 2023).

LEGO Group

At LEGO Group, a toy company based in Billund, Denmark, the implementation of HR analytics has led to significant financial success and minimal employee attrition. This is achieved by integrating people data into every decision made. LEGO's HR analytics journey followed a three-step approach: laying the foundation, building the habit, and growing the competence. Both HR and non-HR managers use pulse surveys to measure

employee motivation, satisfaction, and engagement. The HR analytics platform has enabled non-HR managers to enhance diversity, equity, and inclusion within their teams. There is a strong correlation between employee motivation and satisfaction with business productivity and financial results (Harvard Business Review, 2022).

Protective Life Corp.

Protective Life Corp., based in Birmingham, Alabama, leverages HR analytics to extract, analyze, and present employee data, providing insights that inform top management decisions. This integration of HR and business data offers valuable insights to managers beyond the HR department. Protective encouraged managers to promote the use of paid time off (PTO) to support employees' mental health and well-being, which helped avoid a surge of unplanned absences at year-end. Analyzing the impact of managers' PTO usage on their direct reports revealed that employees tend to mirror their managers' behavior regarding PTO usage. The company found a positive correlation between PTO usage and employee retention (Harvard Business Review,2023)

Implication

This article underscores the transformative potential of Artificial Intelligence (AI) and HR analytics in reshaping Human Resources (HR) practices and driving organizational success. By synthesizing insights from literature and real-world case studies, the article highlights several key impacts:

Enhanced Decision-Making:

- The integration of AI and analytics in HR enables data-driven decision-making, shifting away from intuition-based approaches. This transformation allows organizations to make more informed and strategic choices regarding workforce management, ultimately improving overall business performance.

Improved Employee Engagement and Retention:

- Case studies, such as the LEGO Group, demonstrate how the use of HR analytics can lead to higher employee motivation, satisfaction, and engagement. These factors are strongly correlated with increased productivity and reduced employee attrition, contributing to a more stable and effective workforce.

Addressing Skill Gaps:

- The article identifies the significant barriers HR departments face in adopting data-driven approaches, particularly the lack of data literacy and technological skills. By highlighting these challenges, the study emphasizes the need for HR professionals to upskill in data and technology literacy, which is crucial for fully leveraging the benefits of AI and analytics.

Strategic Role of HR:

- The adoption of advanced HR analytics positions HR functions as strategic enablers within organizations. By providing insights that align talent strategies with business transformation objectives, HR can play a more central role in achieving organizational success.

Cross-Functional Collaboration:

- Effective implementation of HR analytics requires collaboration across various departments. The study underscores the importance of cross-functional cooperation and data sharing to overcome siloed data and enhance the overall effectiveness of HR analytics programs.

Proactive HR Management:

- The shift from reactive to proactive HR management, facilitated by predictive analytics, allows organizations to anticipate future trends and challenges. This proactive approach enhances organizational effectiveness and competitiveness in a rapidly changing business environment.

Overall, the article illustrates how embracing AI and HR analytics can revolutionize HR practices, making them more strategic, data-driven, and aligned with broader business goals.

Conclusion

The integration of Artificial Intelligence (AI) and HR analytics has the potential to revolutionize HR practices, enhancing workforce management and organizational performance. Despite this potential, HR has been slower than other business areas in adopting these technologies. This article highlights the benefits, barriers, and impacts of AI and HR analytics on organizational effectiveness and competitiveness.

Key findings indicate that AI and analytics improve decision-making, employee engagement, and retention. However, significant challenges like skill gaps and resistance to change hinder their widespread adoption. The need for HR professionals to upskill in data and technology literacy is critical. Case studies, such as the LEGO Group, demonstrate the practical benefits of HR analytics, including enhanced productivity and financial performance.

Adopting advanced analytics positions HR as a strategic enabler, central to achieving business goals. Cross-functional collaboration and breaking down data silos are essential for successful HR analytics programs. By transitioning from reactive to proactive HR management, organizations can better anticipate future trends and challenges.

In conclusion, embracing AI and HR analytics is essential for HR to remain strategic and effective. Overcoming barriers to adoption will lead to significant rewards in organizational effectiveness and business performance. The future of HR lies in leveraging AI and analytics to drive strategic decisions and achieve success.

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The Impact of AI Utilization on the Effectiveness of Piano Pedagogy Method Components for Advanced Learners

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Abstract

This study investigates the effectiveness of utilizing artificial intelligence (AI) in enhancing the core components of piano pedagogy for advanced learners. The core components considered include music reading and notation, technical exercises, aural skills, repertoire, improvisation, physical technique, musical expression, and performance practice. By systematically reviewing existing research, this paper aims to understand how AI applications can cater specifically to the needs of advanced piano students and propose future research directions to maximize the benefits of AI in higher-level piano education.

This study presents and characterises a universal loyalty platform utilising blockchain technology, discusses its characteristics, and proposes a research model for participation factors and satisfaction of universal loyalty platforms. A blockchain-based universal loyalty platform can overcome the limitations of traditional loyalty programmes, such as the complexity and longevity of obtaining and redeeming rewards, limited consumer rights, and security risks. The characteristics of blockchain technology, including cryptography (security), decentralisation, transparency, and smart contracts, contribute to enhanced security and efficiency for users. Furthermore, since the rewards earned by users are stored in a virtual wallet or account within the blockchain-based universal loyalty platform, they can be managed by the user and transferred and transacted between users according to the situation. From a business perspective, businesses can effectively participate in the platform network through smart contracts to attract new customers. Conversely, consumers can utilise their rewards in a wider range of regions and industries, thereby achieving scalability. From the customer perspective, the process of utilising rewards obtained from past consumption activities is not the sole objective. The acquisition and utilisation of rewards (tokens) on the universal loyalty platform should be perceived as an enjoyable and rewarding experience, which will encourage continued engagement.

1. Purpose of the Study

The primary objective of this study is to systematically review and analyze the effectiveness of artificial intelligence (AI) in achieving the core components of piano teaching for advanced learners. These components include music reading and notation, technical exercises, aural skills, repertoire, improvisation, physical technique, musical expression, and performance practice. The goal is to understand how AI can specifically enhance the learning experience and outcomes for advanced piano students and to propose future research directions to further optimize these technologies.

2. Prior Research

Previous studies have demonstrated various applications and benefits of AI in piano education:

Smart Evaluation and Feedback: AI systems provide real-time feedback on advanced technical aspects and musicality, which is crucial for advanced students who require detailed and nuanced guidance (Frontiers, 2023).

Adaptive Learning Platforms: These platforms adjust the difficulty of exercises and repertoire based

on the learner's performance, offering tailored challenges that are essential for advanced skill development (Education and Information Technologies, 2020).

Aural Training: AI applications generate personalized ear training exercises, which are critical for advanced students to refine their aural discrimination and musicianship (Technologies, 2023).

Repertoire Selection: AI tools can suggest advanced repertoire that matches the student's skill level and musical preferences, enhancing motivation and engagement (Journal of Intelligent & Fuzzy Systems, 2021).

3. Research Methodology

This study employs a literature review methodology to explore the effectiveness of AI in piano education for advanced learners. Relevant research from major databases and academic journals is collected, analyzed, and systematically organized to understand how AI technologies impact each core component of advanced piano teaching. The analysis evaluates the current state of AI applications, identifies gaps, and suggests areas for further research and development.

4. Expected Research Outcomes

The study is expected to provide a comprehensive understanding of how AI can be effectively applied to enhance the piano education of advanced learners. Specific outcomes include:

Detailed insights into the advantages and limitations of AI technologies in music reading and notation, technical exercises, aural skills, repertoire, improvisation, physical technique, musical expression, and performance practice.

Identification of best practices for integrating AI into advanced piano pedagogy.

Recommendations for future research to address current challenges and optimize the use of AI in advanced music education.

5. Anticipated Conclusion

AI holds significant potential to transform advanced piano education by offering personalized, efficient, and engaging learning experiences. However, several challenges need to be addressed, such as improving the emotional feedback capabilities of AI systems, ensuring seamless integration with traditional teaching methods, and addressing data privacy concerns. This study will propose solutions to these challenges and highlight the transformative potential of AI in advanced piano pedagogy, aiming to inspire further research and innovation in this field. By understanding how AI can contribute to advanced piano education, this study aims to develop effective educational strategies that leverage AI's capabilities to improve teaching and learning outcomes for advanced learners.

Keywords: *Artificial Intelligence (AI), Piano Teaching, Music Education, Adaptive Learning, Smart Evaluation, Aural Skills, Musical Expression*

Exploring the Integration of ICT in the Prospects and Challenges of Food Security in Karnali Province of Nepal

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Abstract

Food security is the state in which individuals possess both the physical and economic means to obtain an adequate supply of food that is safe, nutritious, and aligns with their dietary requirements and preferences, enabling them to lead active and healthy lives (World Food Summit, 1996). Information and Communications Technology (ICT), is the infrastructure and components that enable to improve the way humans create, process and share data or information with each other. It helps to promote transparency, efficiency, inclusiveness and participation.

Because of geographical complexity, topographical hurdles, unproductive barren land, primitive technology, socio-economic, education and awareness level of the country; there is not equal access of all people to food and such condition is found to be more serious in hilly and mountainous region of Karnali. The food market of Karnali has not been as it should be in an open market economy. So, to maintain the food security in the region, seriousness and honesty in the role and responsibilities of each stakeholder (involved directly or indirectly in the food security of the country) along with adoption of modern information and communication technology is most.

The objective of this study is to explore the integration of ICT in the prospects and challenges of food security in the Karnali province of Nepal and it is planned to achieve it by exploring the existing status of food security, adoption Status of Information and communication technology in each stage of maintaining food security and finally recommending the possible strategies to minimize the gap and secure food security situation in Karnali. To meet the aforementioned objectives, the qualitative and quantitative natured primary as well as secondary data will be taken. Stakeholders contributing in the food security of the region act as the population of the data which will be identified from the secondary sources and literatures as well.

This study will be significant as it will contribute in addressing food security issue of the region, provides feedback to the policy maker which helps to ensure the return of the government investment in the very field. This study will well explore the prospective role of individual/ firm/ other factors associated with the production, storage, supply chain, consumption of food along with ICT in each stage. It is expected that the study will provide valuable base to strengthen the food security position in the existing scenario.

Keywords: *food security, geographical complexity, information and communication technology, supply chain, stakeholders*

Introduction

Nepal is a landlocked country with different and complex geographical territory. It has the population of 29.16 million according to population census 2021 with annual growth rate 0.92% per year spreading from far east to far west, Hilly, mountain to Terai region, rural to urban area. There is the vast diversity in production of staples, indigenous food/ cash crops. Because of geographical complexity, topographical hurdles, unproductive barren land, primitive socio-economic, education and awareness level of the country; there is not equal access of all people to food and such condition is found to be more serious in hilly and mountainous region of Karnali.

Karnali province lies between $80^0$58’58” & $83^0$40’57”

East longitude and $28^{0}10'7''$ & $30^{0}26'50''$ North latitude. It has an area of 27984 sq.km i.e. 19.01% of the total area of the country with population 16,88,412. Population density is 60 cubic km. It is bordered by Lumbini Province in the south, China in the north, Sudurpaschim Province in the west and Lumbini Province and Gandaki Province in the east.

Topographically, the province is divided into four main regions starting from the the high Himalayan Region, Mahabharat region, mid mountains, valleys, and Chure in the south. The highest peak point of the province is Churen Himal (7348 m). Surkhet valley is the capital of the Karnali Province. Limi valley in Humla district of the province lies at an altitude above 4000 meters.

Apart from the topographical divisions, administratively there are 10 Districts. As per the new constitutional provision there are 79 local governments composed of 25 municipalities and 54 rural-municipalities with 718 wards.

Karnali province has climatic variations, which is associated with the diverse nature of its topography and altitude. Climatic zone of Karnali province starts from High Himal in the north, above 7000m with tundra and arctic climate to Chure region in the south with sub-tropical climatic zone. The average annual precipitation of the province is 1479 mm. According to studies Karnali Province is facing decrease in annual precipitation by 4.91mm yearly. Average annual temperature of the province is 26.10^{oc}. The maximum and minimum temperature of the province is increasing yearly by 0.05 (maximum) and 0.01 (minimum).

Karnali Province is named after the longest river Karnali, measuring 507 km. Karnali River has many sub basins namely Bheri, Mugu Karnali, Tila, Lodi, Dojam, Seti, Babai, Rapti etc. 95% of the Karnali River flows in Nepal, remaining parts are in India and China. Karnali Province is rich in Lakes and Ponds. There are 936 lakes in the province, among which 429 lakes are above 5000 m including the largest lake Rara and deepest Lake Phoksundo of the country.

As per Economic Survey (2022/23), Karnali Province contributes 4.1% to national GDP and GDP per person in Karnali Province is only 997 US Dollar and it is estimated to have a growth rate of 2.2%.

According to Nepal Rastra Bank report 2023, there are altogether 620 banks including commercial banks, development banks, finance companies and Microfinance companies in the province, which is 4% of the total banking and commercial institutions in the country. Similarly, According to National Census 2021, among total household of the province, there are 20.3% users of internet, 45.9 % user of radio, 17.6% television, 5.6% computer/ laptop, 82.2 % normal phone, 58.4% smart mobile phone in the province. The literacy rate of the province is 76.1% in which 83.3% male and 69.4% female are literate. Economically active population is 71.7% of the population of the province. 69.8% population is engaged in agriculture, forest and fishery.

Agriculture and forest are the mainstay of province economy, providing a livelihood for three-fourths of the population and accounting 32.9% of GDP. Industrial activity in the province accounts very low and it shares only 13.8% of GDP, while service sector has a share of 53.3% in provincial GDP. Productivity of paddy in the province is 3.46 MT per ha, which is below the national average productivity of 3.8 MT per ha.

Out of the total paddy production in the country, Karnali Province comprises 2.4%. Similarly, 8.1% of Wheat, 8.2% Maize, 6.3% Buckwheat and 43.7% Barley is produced in the province.

Nepal has ensured the access of food to all its citizens through its constitution. Constitution of Nepal, 2072 has provided for the right to food as fundamental rights saying every citizen shall have the right relating to food, every citizen shall have the right to be safe from the state of being in danger of life from the scarcity of food; every citizen shall have the right to food sovereignty in accordance with law.

Nepal has many policies as well as institutional provisions for managing food security to its citizen. Food Rights Act -2023 and Food Rights Regulations- 2027, The Right to Food and Food Sovereignty Act- 2075, National Agricultural Policy- 2061, Supply Policy-2059, Consumer Protection Acts 2075 (2018), Public Procurement Act 2063 (2007), National Food Safety Policy 2076 (2019) etc. are some of the policy provisions. The Right to Food and Food Sovereignty Act (2018) has envisioned the right of all Nepali people to be able to access sufficient nutritious food over the year. The Act sketches governing mechanism as per federal structure to ensure food security where federal government has the responsibility to procure food and manage food stocks, and to ensure the stability of basic food prices and supply of subsidized food for food insecure people through the medium of appropriate distribution mechanism.

Food security is the state in which individuals possess both the physical and economic means to

Obtain an adequate supply of food that is safe, nutritious, and aligns with their dietary requirements and preferences, enabling them to lead active and healthy lives *(World Food Summit, 1996)*. Broadly, food security has four major dimensions: food availability, food access, food utilization and the food stability. The food stability acting through food availability, access, and utilization leads to the food security.

In Nepal, according to NPC 2023, over 15.1 percent of the population are living under the national poverty line and suffering by food insufficiency. Multi-dimensional poverty is 39.5% in Karnali province.

Likewise, in order to maintain supply chain, address the crisis and emergencies, government has policy to maintain stock of the food stuffs in the National Food Reserve and SAARC Food Bank. Government of Nepal has an institutional provision to act to provide food security in Nepal. Food Management and Trading Company Limited has been established as a government wing to contribute in the food security of the country (Cabinet decision of 2076/02/10). This institution has a long history in the field of food supply with different name and form in the different period of time right from the Earthquake of 1990 BS in Rana Reign.

Food Management and Trading Company Limited (FMTCL) is the only parastatal organization of the Government of Nepal (GoN) with the objective of ensuring food security of Nepal and helps in achieving the Sustainable Development Goal of zero hunger by 2030. Government has formed this institution with the following objectives which directly or indirectly influence food security situation of the country (According to MOA, AOA of FMTCL).

In the open market economy, market needs to run with the interaction of demand and supply where market intermediaries enter and exit freely. But because of different circumstances, it is not being as it should be. So, a kind of government interference is required. And on behalf of the government, FMTCL is working for it. Its main scope is the rural Hilly and mountainous region where adequate production and/ or smooth supply of good and services from public sectors cannot be guaranteed.

The primary focus of FMTCL has been to work in smoothening of supply chain of rural areas and to contribute in increasing the production and productivity of the region. But the food security level is not satisfactory. Production and supply of food has not been as per need. Rigid rules and regulations in the dynamic business environment, limited use of ICT, over expectation of the target groups, lack of fair explorations of the problem (political biasness), unpredictable and inconsistent food aid program, undue interest of stake holders in performing own's duty/ responsibilities, unfair business environment, lack of visionary leadership having corporate, business and entrepreneur mindset are some of the bottlenecks to achieve the targeted objectives.

Enhanced professionalism and efficiency of the FMTCL with appropriate policy reform is the need to address the contemporary issues. So, this research can be of great help to the policy maker, executor and even the service seeker along with other key stakeholder.

Problem Statement

Since Nepal's geography is complex (remote), market is not adequately present all over the country. The privately owned organization cannot earn profit doing business in such areas. They are interested to do their business in the most profitable area only. So, it is the responsibility of the government to supply food and other necessary goods in such areas. Likewise in the crisis and emergency situation, private organizations don't show honesty in doing business which has been experienced in the different natural disaster occurred. On behalf of government FMTCL is supplying food grains (mainly rice) in the specified districts of Nepal. FMTCL maintains specified quantity of food grains in National Food Reserve and in the SAARC Food Bank which is used at the time of emergency/ crisis in order to make supply chain regular and smooth. FMTCL provides specified quantity of food grains in each death and birth event in the five districts of Karnali Province (Former Karnali Zone) for free. FMTCL sales food grains at the time of major festivals of Nepal like Dashain, Tihar and Chhat at the discounted price to intervene /to discourage unnecessary price hike and black marketing even in urban areas. FMTCL purchase negligible percentage of paddy, wheat, indigenous (nutritious local products) from the Nepalese farmers.

Though the FMTCL playing important role in the food security, it is not enough/ sufficient. It is supplying limited quantity of food in the limited areas only which has not addressed the need of all targeted population and areas. FMTCL is one and only institution of the government to work in the field of food security. It has wider network spreading from east to west, mountainous, hilly and terai region with infrastructure, human resource, fixed assets etc. Government provides subsidy in transporting the food stuffs and policy supports as well.

Target populations and areas are not getting enough food from FMTCL in the regular basis. Real time information regarding production, import, storage, supply pattern enables to address food security related issues. Use of modern equipment in production, storage, transportation, distribution helps to increase efficiency in food supply chain management. But use of modern means of communication and technology is very primitive in the Karnali region.

ICT helps to inform the policy maker, the actual scenario of the target area in order to make realistic policy and program and form such policy/program to the target farmers that enables to get benefited, improves farmers access to market information and sales decision. It focuses on collecting information from various point in food processing and supply chain. ICT increases efficiency and productivity in food production.

Objective of the Study

The general objective of this study is to explore the integration of ICT in the prospects and challenges of food security in the Karnali province of Nepal. To achieve this objective, the study is focused to explore the existing status of food security, to know the adoption Status of information and communication technology in each stage

of maintaining food security, to explore the prospects and challenges of food security in the Karnali province and to recommend the possible strategies to minimize the gap and secure food security situation in Karnali.

Significance of the Study

Since food security is the global and seriously taken issue, it is not apart in Nepal. So, conclusion of this study will contribute in addressing food security issue of the region, provides feedback to the policy maker which helps to ensure the return of the government investment in the very field, provide valuable base to strengthen the food security position in the existing scenario.

Methodology

Study is based on Karnali Province of Nepal. Stakeholders contributing in the food security of the region act as the cluster of the data which is identified from the secondary sources, policy documents and literatures as well. For example: three tires of the government (federal, provincial and local level), private sector transporters, food producer (farmers), entity that stores food in a qualitative manner, development partners, cooperatives, different groups. Qualitative and quantitative types of data and information are obtained from the secondary sources, the literatures, policy documents and different publication of Nepal Government. Qualitative types of data/information are obtained by observing the activities of the stakeholders, by talking informally with them. It has helped to gather information to explore existing status.

Discussion of Results and Implications of the Study

From the study of various policy documents, literatures and observation and discussion with stakeholders, food security influencing factors are found to be personal/ household income, level of education/awareness, subsidies provided by the government, possibility of farmers union, agricultural production and productivity, natural calamities, use of modern means of technologies and communication in different level of food supply chain, political environment and stability

This study well explores the existing scenario in the Karnali Province and recommend the prospective role of individual/ firm/ other factors associated with the production, storage, supply chain, consumption of food. The issue of food insecurity in the Karnali province are because of various reasons like illiteracy, low purchasing power, limited nutritional knowledge, underutilization of resources, centralization of power in the past, lack of strong leadership in the region. Along with these factors, widespread poverty, lack of skilled human resource, inequality, starvation, complex geography and topography are equally responsible for the food insecurity. Because of migration out, foreign employment, lack of proper market, lack of market and transportation facility, most of the cultivating lands are found to be barren.

The study also well informs how ICT helps to improve the situation in all pillars of food security in the region. There are mainly four pillars of food security. Availability, accessibility, utilization and stability. The role of ICT in all pillars becomes vital and increases the efficiency. With the help of ICT, food output can be boosted, and monitor the level of stock available. Proper plan can be made with the information of production forecast, stock available, possible and profitable ways of importing the deficit quantity. Mechanism of disseminating the real time data/ information ensures proper planning and its execution accordingly.

With the help of ICT, planning can be made to make the food available in the target areas with pre knowledge of the climatic condition, road condition, available stock quantity.

To ensure the food security situation not only availability, proper utilization is also most. Awareness program regarding the food utilization, reducing food loss becomes vital. Through the available and relevant media like radio, television, mobile etc., information can be disseminated to the stakeholder which enriches/ empowers their functioning. For this, policy should be made to increase the access in such media

Stability is another concern of food security. To make the necessary food available all around the year; demand forecast, forecast of food availability, arrangement of deficit quantity and proper transportation means are necessary. ICT plays vital role in increasing efficiency in them. As the data shows, the adoption of modern communication means and the technologies is very much limited, proper investment should be made in these areas.

In the end, the study provides valuable base to strengthen the food security position in the existing scenario.

From the study of different policy documents, literatures of the related subject matter, discussion made with the stakeholders, observing their activities, there can be found lots of prospects of food security in Karnali. Some of them are as follows:

1. Expansion of road access.

Easy access to the road is very important factor for food security in the reason. So, the government should invest in the expansion of road network that can connect the producer with consumer in an effective and efficient manner. And marketing intermediaries can play effective role. The government has priority in the expansion of road facility in the Karnali province.

2. Government subsidy policy in agriculture and transportation

Due to geographical complexity, low productivity, low-income level of the people to invest in the agriculture; financial support from the government side is most. Likewise, regarding the transportation of food grains, private sectors are not interested to do business in the

less profitable area, presence of the government should be there. It can be possible with appropriate government subsidy policy. That policy should be communicated well through proper communication media with the stakeholders like political representative, local people and other concerns. Subsidy policy should be clear, transparent, result oriented and target group focused in order to get benefited.

The beauty of federal system is presence of the government in the local level. Local level government bridges the central government in suitable policy formulation which is possible to execute well. It provides proper coordination and cooperation in establishing food security infrastructure like road, transportation, irrigation, storage warehouse. Implementation of policy formed in the participatory ways gives positive result.

3. Government policy to make local product reach to the market of urban areas.

Now a days, Local government is aware of local, underutilized, high valued, nutritious and medicinal valued product. They are very much interested in promoting it. This can be the great help to secure food security position and welfare of the people. They are bridging for increasing productivity and marketing of the product. Federal government should have policy for proper coordination and cooperation to make it effective and efficient.

4. Crop diversification/bio diversity conservation

Production of crops that is compatible with changing climatic condition (Adopting eco-friendly agriculture) of the country is the very good idea to contribute in the food security and economic wellbeing of the people. So, government should encourage to produce high valued, productive, climate friendly and early maturing crops.

5. Food consumption pattern/dietary diversity

In order to ensure food security in the province, awareness among the people regarding food habit and encouragement to use what is produced locally will be great help. It helps to save transportation cost, import cost. It also helps to increase production and productivity of the local food items. And ultimately increases the economic well-being of the people and society as a whole.

6. Use of ICT

Promoting education and literacy to empower the poor/ under privileged group is essential to ensure the food security situation in the province. ICT can help to achieve this in an effective manner. The government has policy to increase the investment in the means of communication and technology as well. It will be the great help to the people of the area.

In the end, policy implication to improve food security can be; increase income of individual/ household, increase in local food production, effective food aid support, increasing level of education/awareness, clear financial subsidy policy, increase in agricultural productivity, reducing the impact of natural calamities with proper/ adequate use of the ICT. So, Proper planning, dedication of the policy maker and executing body, use of ICT in each stage can enhance the income generation, prioritizing the local food production, proper use of food, reduce food wastage, food aid support to the needed areas, increasing the level of education, financial subsidies policy, uniting the farmers, encouraging to change the food consumption pattern, adequate investment in infrastructure (road, irrigation, warehouse, means of transportation),proper planning to minimize the effect of natural calamities via ICT.

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Application of Decision Trees and Random Forest Algorithm in Predicting Business Problems/Solutions

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Abstract

The main objective of this article is to see how decision trees and random forests are applied to business problems and solutions. It is used as a machine learning algorithm to predict disease in a patient based on symptoms and test results, segment customers based on purchasing behavior, and evaluate the loan application based on credit history. This study discusses the practices, strengths, and weaknesses of these instruments. An extensive literature review is the primary method of this study.

Keywords: *Decision Trees, Random Forest*

Introduction

Decision makers use decision trees, a machine learning tool for classification and regression tasks. A decision tree has a tree structure, decision nodes, leaf nodes, splitting, entropy information gain, and pruning.

Business organizations use Decision Trees commonly in many fields, not just machine learning. Such fields are operation research, economics, financial management, marketing, etc. In strategic management, business organizations set long-term goals and make vision statements. It fixes how mission statements are named. The most beautiful part of decision trees is they make layers of decisions to reach the goal.

The main idea behind making the decision tree popular isthat it believes in while- box technology, because the decision-making process is visible, logical, and empirical.

Another reason these models are becoming popular is decision tree models can have an in-built feature selection. By structure, it is hierarchical, and making decisions ends witha final goal.

The data needs little or no preprocessing, so anyone who learns it becomes motivated.

Origin of decision trees

The origin of decision trees came with the development of statistics, pattern recognition, and artificial intelligence. It is now considered one of the most used algorithms to solve business problems by classifying and regression.

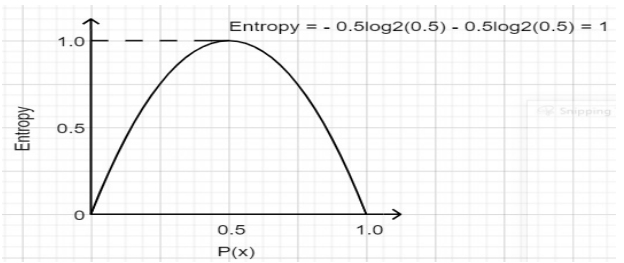
Automatic Interaction Detector (1963) is the first method to partition data recursively and is a precursor for modern decision trees. Morgan and Messangerdeveloped the Theta Automatic Interaction Detector, which became the Iterative DichotomiserAlgorithm(IDA) base in 1972.

Ross Quinlan developed the Iterative DichotomiserAlgorithm(IDA) in 1979,the earliest and most influential algorithm that used information gain as a basis of classification.The CART algorithm came in 1984, introducing Gini Impurity and regression trees for classification and regression purposes. Leo Breiman, Jerome Friedman, Richard Olshen, and Charles Stonetake credit for significant contributions to the classifications of algorithms.

Leo Breiman, Jerome Friedman, Richard Olshen, and Charles Stone are prominent statisticians and computer scientists known for their significant contributions to machine learning and statistics. They are particularly famous for their collaborative work on developing the Classification and Regression Trees (CART) algorithm, a fundamental technique in the field.

The **CART** algorithm developed by these authors is a decision tree technique for classification and regression tasks. It forms the basis of many modern machine-learning methods, and data scientists are widely using this in various applications, including data mining, predictive modeling, and artificial intelligence.

Decision trees become accurate with the help of information gain and Entropy. Entropy is a measure of disorder or impurity in the given dataset—information gain measures the reduction in impurity in the data.



Box 1: Calculation of Entropy

1 The formula for Entropy is

$E(S)=-(P_{yes}\log_2 P_{yes}+P_{no}\log_2 P_{no})$

Pyes is the probability of choosing Yes, and *Pno* is the probability of selecting a No. Here, *Pyes* is ١٠/٦, and *Pno* is 4/10.[3]

$E(S)=-(6/10*\log_2*6/10+4/10*\log_2*4/10)\sim 0.971$

If all the ten observations belong to 1 class, then Entropy will be equal to zero, which implies that the node is pure.

$E(S)=-(1\ \log_2 1)=0$

If both classes, YES and NO, have an equal number of observations, then Entropy will be equal to

$1.E(S)=-(5/10*\log_2*5/10+5/10*\log_2*5/10)=-2(0.5\log_2 0.5)=1$

2 The formula for information gain is

Information gain =Total Entropy - weighted average

Another approach to finding attributes is the Gini index. The Gini index and information gain are used to find impurities and can often be used interchangeably. However, the logic behind choosing one in favor of another is that the Gini index is used for balanced classes, and information gain is used when classes are imbalanced.The decision trees have extended to the C.4 .5 algorithm and random forests in 2001. They are becoming popular in medical diagnosis, financial analysis, customer segmentations, etc.

Box 2: Calculation of Gini Index

Using the Gini Index in Classification Problems

Gini(S) = 1 - (p_1^2 + p_2^2)[4]

Example: To calculate the Gini Index of the dataset, we initially calculate the probability of each class:

p_1 = 6/10 = 0.6 (Positive)

p_2 = 4/10 = 0.4 (Negative)

Gini(S) = 1 - (p_1^2 + p_2^2)

= 1 - (0.6^2 + 0.4^2)

= 0.48

So, the Gini Index of the dataset is 0.48.Gini coefficient and information gain

Presently, suppose we need to split the dataset on an element "X" that has two potential values: "A" and "B." We split the dataset into two subsets given the component:

Subset 1 (X = A): 4 Positive, 1 Negative

Subset 2 (X = B): 2 Positive, 3 Negative

To calculate the decrease in the Gini Index for this split, we initially calculate the Gini Index of every subset:

Gini(S_1) = 1 - (4/5)^2 - (1/5)^2 = 0.32

Gini(S_2) = 1 - (2/5)^2 - (3/5)^2 = 0.48

Then, we utilize the information gain formula to calculate the decrease in Gini Index:

IG(S, X) = Gini(S) - ((5/10 * Gini(S_1)) + (5/10 * Gini(S_2)))

= 0.48 - ((0.5 * 0.32) + (0.5 * 0.48))

= 0.08

$$Gini = 1 - \sum_{i=1}^{n} (p_i)^2$$

Random Forests

Random forests or random decision forests are ensemble learning methods for classification and regression. It can correct the overfitting problems of decision trees.

Its steps are:

Step 1: Create a bootstrap data set from bootstrap data by randomly choosing data.

Step 2: Create randomized decision trees from the bootstrap dataset.

Step 3: Finally,the output of the random forests is the class selected by most trees.

Objectives

This article explores how decision trees and random forests forecast business problems and estimate the answer.

Methods

This article bases its arguments on related literature and a case.

Review of literature

Bhushan Talekar and Sachin Agrawal (2020) detailed studied and reviewed decision trees and random forests. They provided a detailed introduction to the decision tree methods and random forest [5]

Juan H Klopper differentiated machine learning between decision trees and random forests, stating that the basic building block of a random forest is a decision tree. The term decision tree is almostself-explanatory. The algorithm builds a tree structure by making repeated decisions on thedata. As such, it is very similar to a flowchart.[6]

A.D. (Tony) Rollett, R.A. LeSar A decision tree is a tool for making decisions that use a tree-like model of decisions and their possible consequences.[7]

A formal decision tree consists of three types of nodes:[1]

- Decision nodes
- Chance nodes
- End nodes

A decision tree is a greedy approach that tries to solve problems heuristically. Each node tries to solve one problem. It tries to find approximate optimal solutions globally by making these local optimal choices." The algorithm has: 1. At each stage (node), pick out the best feature as the test condition. 2. Now split the node into the possible outcomes (internal nodes). 3. Repeat the above steps until all the test conditions have been exhausted into leaf nodes. "Random forest, as its name implies, consists of many individual decision trees that operate as an ensemble. Each tree in the random forest spits out a class prediction, and the class with the most votes becomes our model's prediction (see figure)."

The basic concept behind Random Forest is believing in the wisdom of crowds. Random forest takes many uncorrelated trees (models) that operate as a committee, which will outperform any of the individual models. A key feature is that the models must have a low correlation between them. The low correlation between trees protects each of them from their particular errors.

Jehad Ali, Rehanullah Khan, Nasir Ahmad, and Imran Maqsood, in their works" Random Forests and Decision Trees,"compared the classification results of two models, i.e., Random Forest and the J48, for classifying twenty versatile datasets. They observed 20 data sets available from the UCI repository [1] containing instances varying from 148 to 20000. They found that the classification results show that the Random Forest gives better results for the same number of attributes and large datasets, i.e., with a more significant number of instances. At the same time, J48 is handy with small datasets, i.e., fewer instances.

Berhane, Lane, Wu, Autrey, Anenkhonov, Chepinoga, and Liu (2018) discuss using decision-tree, rule-based, and random forest classification methods for analyzing high-resolution multispectral imagery in wetland mapping and inventory. They contrast three nonparametric machine-learning algorithms (D.T., R.B., and R.F.) using a sizeable field-based dataset (n = 228) from the Selenga River Delta of Lake Baikal, Russia. They used an experimental method. They found all classifiers suitable; the R.F. classification outperformed the D.T. and R.B. methods, achieving OA >81%, including a texture metric (homogeneity)[2].

Table 1: the difference between decision trees and random forests

Property	Decision Tree	Random Forest
Nature	Single Decision Tree	Ensemble of multiple decision trees
Interpretability	Highly interpretable.	It is less interpretable due to its ensemble nature.
Overfitting	It is more prone to overfitting,especially in the case of deep trees.	Due to ensemble averaging, it is less likely to be overfitted.
Training Time	Using a single tree makes training time and decision-making faster.	The use of multiple trees takes more training time and decision time.
Stability to change	It becomes quite sensitive to variations in data.	The result is fixed and does not change because the ensemble method works.
Predictive Time	It is faster than random forest prediction. Faster prediction as compared	Multiple predictions, hence longer prediction time and slower prediction speed.
Performance	It can perform well on small and large datasets as well.	Generally, it performs well on large datasets.
Handling Outliers	It is more susceptible to outliers.	Due to ensemble averaging, more is comparatively robust to outliers.
Feature Importance	Provide feature scores directly, which are less reliable.	Do not provide the feature score directly;instead, use an ensemble to decide the feature score.

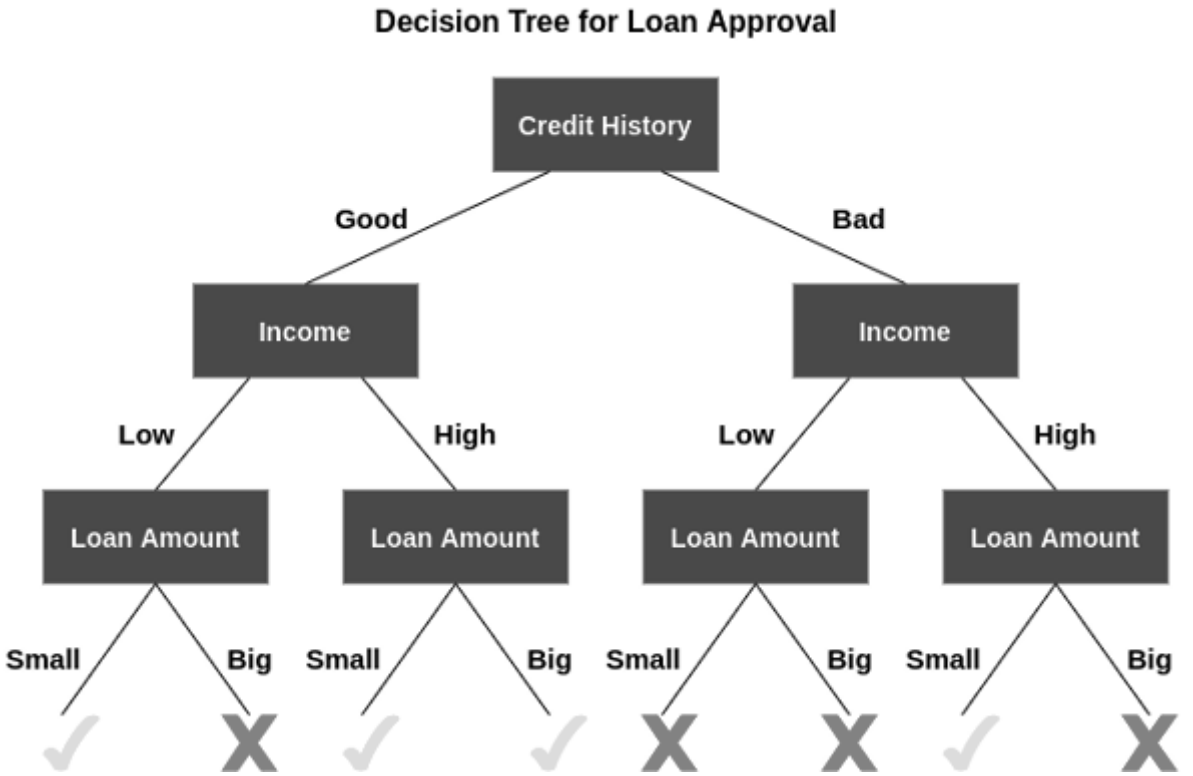
Source: https://www.analyticsvidhya.com/blog/2020/05/decision-tree-vs-random-forest-algorithm[8]

Exemplary diagram of decision tree and random forests

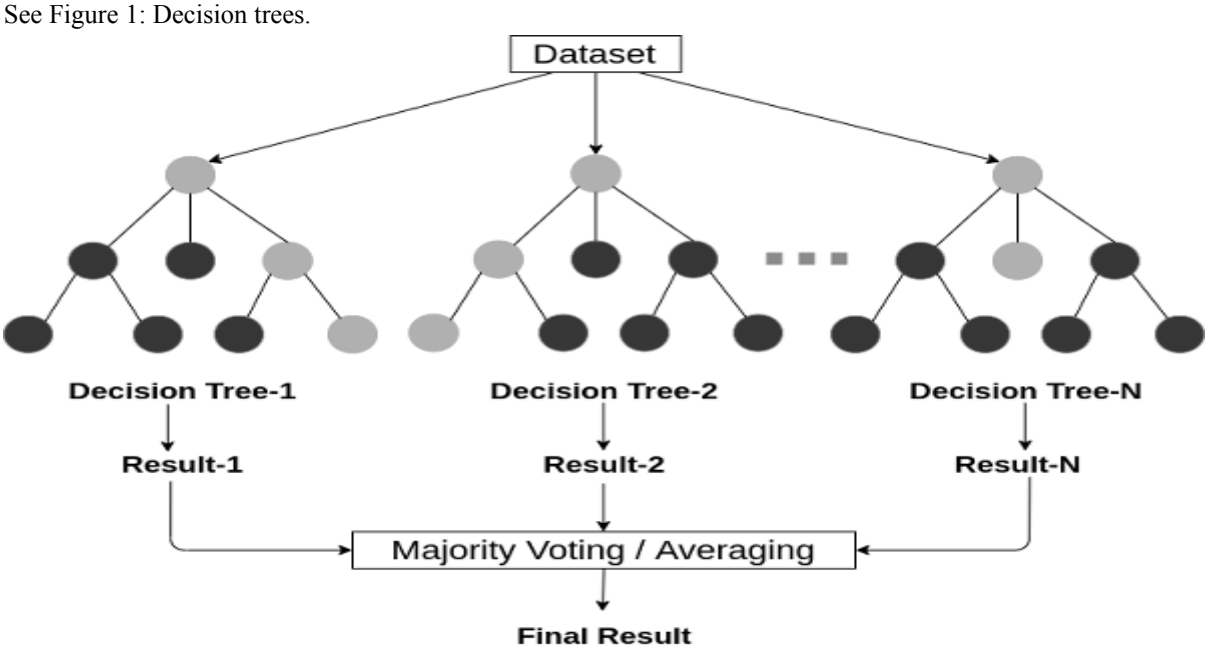
A single variable with two or more attributes can analyze decision trees. For example, thediagram below shows one variable, credit history, and another, income. Credit history has two attributes, excellent or bad, and income has two attributes, one of which is high income. The decision tree tries to answer whether people with a good history can get loans if they have low incomes. The answer is "no." however,if low-income people have a good credit history, they can get a small loan. Sometimes, decision trees can be overfitting and underfitting, so correcting the problem of making random forests is necessary. The bootstrap procedures use the same data to create several trees in a random forest. Averaging or majority voting to the different results of decision trees, whatever is suitable, works here.

Under decision trees, there is a primary variable at the top called the root note, and other notes are called child nodes and terminal nodes.

Simple application decision trees in the bank while giving loan



See Figure 1: Decision trees.



Conclusion

Businesses can take advantage of features like interpretability, accuracy, and robustness, which handle different types of data feature selection.

Decision trees and random forests have applications in critical areas where businesses depend, grow, and sustain. These areas include customer segmentation, predictive maintenance, risk assessment, sales forecasting, and customer churn predictions. However, some challenges include data quality, overfitting, and computational resources.

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Annex

Sample example of decision trees

Step 1: Select the data set

Decision trees from the given data set

day	Weather	Tempera-ture	humidity	Wind	Pay foot-ball
1	Sunny	Hot	High	Weak	No
2	Sunny	Hot	High	Strong	No
3	cloudy	Hot	High	Weak	Yes
4	Rain	Mild	High	Weak	Yes
5	Rain	Cool	Normal	weak	Yes
6	Rain	Cool	Normal	Strong	No
7	Cloudy	Cool	Normal	Strong	Yes
8	Sunny	mild	High	Weak	No
9	Sunny	cool	Normal	Weak	Yes
10	Rain	Mild	Normal	Weak	Yes
11	Sunny	Mild	Normal	Strong	Yes
12	Cloudly	Mild	High	Strong	Yes
13	Cloudly	Hot	Normal	Weak	Yes
14	Rain	Mild	High	strong	No

Step 2: calculation of entropy and information gain Rule (one sample demonstration for the Weather column)

Calculation of weather entropy and information gain		
Entropy of all data set		
The Entropy of entire S (9, -5)	-9/14 *LOG_2(9/14)-5/14 *LOG_2(5/14)=.	0.940286
Entropy of attributes		
Sunny (2,-3)	(-)2/5 *LOG_2(2/5)-3/5 *LOG_2(3/5)	0.970951
Cloudy (4,-0)	(-)4/4 *LOG_2(4/4)-0/4 *LOG_2(0/4)	0
Rain (3,-2)	(-)3/5*LOG_2(3/5)-2/5*LOG_2(2/5)	0.970951
Information gain	14/14* entropy of entire-5/14*Entropy of sunny -4/14 *Entropy of cloudy -Entropy of rain=	0.24675

from Sunny point of view

weather	temperature	humidity	wind	Yes/no
sunny	Hot	High	Weak	No
sunny	Hot	High	Strong	No
sunny	mild	High	Weak	No
sunny	Mild	Normal	Strong	Yes
sunny	cool	Normal	Weak	Yes

from a rain point of view

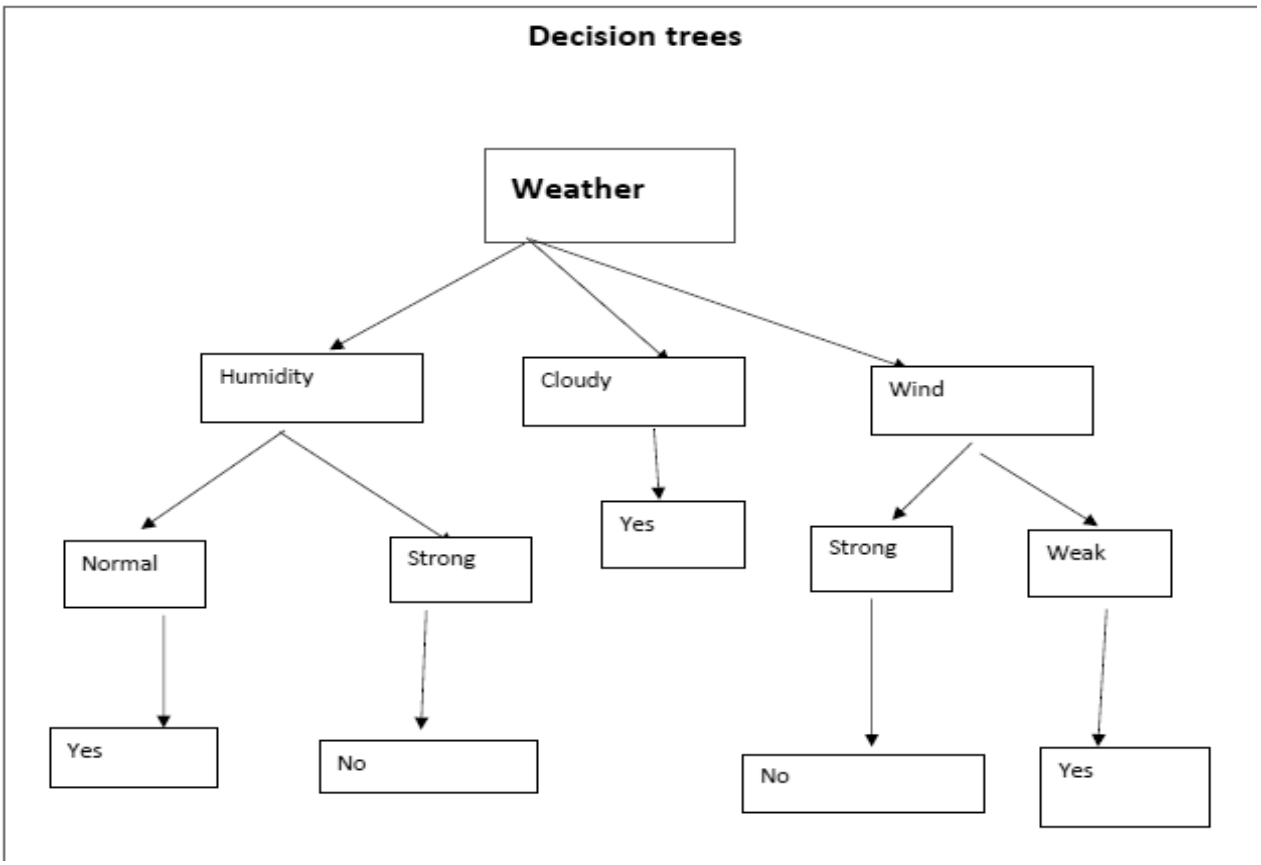
	temperature	humidity	wind	Yes/no
rain	Rain	Mild	High	Weak
rain	Rain	Cool	Normal	weak
rain	Rain	Cool	Normal	Strong
rain	Rain	Mild	Normal	Weak
rain	Rain	Mild	High	strong

Step 3: Enterploy calculation

Entropy calculation of the whole data set								
Calculation of	attributes	yes	no	total	entropy		**Inf gain**	
Entire	entire	9	5	14	0.94	0.940		
calculation of temperature	hot	2	2	4	1.00	0.286		
	mild	4	2	6	0.92	0.394		
	cool	3	1	4	0.81	0.232	0.03	
calculation of humidity	high	3	4	7	0.99	0.493		
	normal	6	1	7	0.59	0.296	0.15	
calculation of wind	weak	6	2	8	0.81	0.464		
	strong	3	3	6	1.00	0.429	0.05	
calculation of weather	sunny	2	3	5	0.97	0.347		
	cloudy	4	0	4	0.00	0.000		
	rain	3	2	5	0.97	0.347	**<u>0.25</u>**	Greatest gain
Entropy calculation from Sunny point of view								
calculation of sunny as the entire	entire	2	3	5	0.97	0.971		
calculation of temperature	hot	0	2	2	0.00	0.000		
	mild	1	1	2	1.00	0.400		
	cool	1	0	1	0.00	0.000	0.57	
calculation humidity	high	0	3	3	0.00	0.000		
	Normal	2	0	2	0.00	0.000	**<u>0.97</u>**	greatest gain
calculation of wind	strong	1	2	3	0.92	0.551		
	weak	1	1	2	1.00	0.400	0.02	
Entropy calculation from Rain point of view								
calculation of rain as an entire	entire	3	2	5	0.97	0.971		
tempera	hot	0	0	0	0.00	0.000		
	mild	2	1	3	0.92	0.551		
	cool	1	1	2	1.00	0.400	0.020	
humidity	high	1	1	2	1.00	0.400		
	normal	2	1	3	0.92	0.551	0.020	
wind	weak	3	0	3	0.00	0.000		
	strong	0	2	2	0.00	0.000	**<u>0.971</u>**	Greatest gain
An entropy calculation from a cloudy point of view is not necessary.								

Step 4 Decision trees

Method of making a decision tree an example



Application of Divide-and-Conquer Algorithm for Business and Nonbusiness Problems

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Abstract

The divide-and-conquer algorithm is a powerful problem-solving technique that breaks down a problem into smaller, more manageable sub-problems, solves each sub-problem recursively, and then combines their solutions to solve the original problem. E-commerce companies use these algorithms to sort product listings, enabling efficient searches and recommendations quickly. This technique involves breaking down a complex project into smaller, more manageable tasks and subtasks in project management. In non-business, computer science uses examples such as search engines in various applications, including databases, search engines, and libraries, to quickly locate data. Discrete Cosine Transform (DCT) used in JPEG compression breaks down an image into smaller blocks, compresses each block, and then combines them. In natural sciences like biology, its uses are helping identify genetic information, studying evolutionary relationships, and diagnosing genetic disorders. This article tries to develop further insight into this algorithm in different behavioral sciences and business cases.

Keywords: *Divide-and-Conquer Method, business analytics*

Introduction

This article examines how business managers and leaders solve complicated problems in organizations, whether business or nonbusiness types. For this reason, the article includes several sections, such as background, materials and methods, results, and discussions.

Background and history

Though computer scientists and IT professionals have made divide-and-conquer algorithms the talk of the town, its history is old. It began with human civilizations when people started learning about analytical problems and applying steps to reach the goal. At that time,people killed wild animals in a sequence of steps: from searching materials for weapons, making weapons, targeting the wild animals correctly, etc,and then killing them wasthe outcome. In the same way, businesses nowadays become strategic in solving the problems of selling the products from the initial marketing steps- understanding the customers. Sun Tzu (c. 481-221 BCE) was a Chinese military expert who gave the idea of using divide and conquer rule to win the battle. The rule suggests dividing the enemies into smaller groups and defeating them by one[1].

The idea of breaking complex problems into smaller units and solving them manageable started from 1830BC–1531 BC[1], called the idea of**old** Babylonian Mathematics.

From 1946 to the modern computer age, divide and conquer became very popular inIT, data science, data analysis, engineering, and management[2]. John Mauchy and John P. Eckert designed a device called the first general-purpose computer.

The credit forthe divide and conquer rule goes to Carl Friedrich Gauss(1777–1855, who brought the concept of The mathematician Carl Friedrich Gauss (1777–1855) of two complex numbers (a + bi)(c + di) = ac − bd + (bc + ad)I seem to involve four real-number multiplications, one can do this with just three: ac, bd, and (a + b)(c + d), since bc + ad = (a + b)(c + d) − ac – bd[3]. The main reason for the birth of divide and conquer is to break down complex problems into smaller, solvable parts, leading to more efficient solutions. If you have further questions or need additional details, [3]

Behavioral scientists use the divide-and-conquer algorithm in many psychological and sociological fields, including business. Cognitive psychologists emphasize the term chunking to organize the total information into meaningful chunks(groups) to keep them in the memory and make memorization effective [4].

Hierarchical thinking in the human beings in the society obeys therule of divide and conquer rule of algorithm. Social members do not treat people or objects equally; they come in order based on specific classifications, like parents, elders, first class, second class, etc. This type of classification brings comparison, judgment, and competition and makes society dynamic. [4]

Review of literature

OF Morera 1, DV Budescu(nd) studied A Psychometric A nalysis of the "Divide and Conquer" Principle in M ulticriteria Decision Making. Their objective was to discuss divide and conquer aspsychometric thinking. As they assumed, their study method was psychometry, also known as token-object reading. This purported psychic ability allows a person to make associations or gather information about an object by making physical contact with it. Here's a breakdown of critical elements related to psychometry.

Comparative analysis of whole and decomposed form of any system Compares with AHP and SMART. As they stated, findings increase psychic ability, allowing a person to make associations or gather information about an object by making physical contact with it. It violets AHP, which means the Analytic Hierarchy Process (AHP), is a structured technique for organizing and analyzing complex decisions. Thomas L. Saaty developed it in the 1970s, and it is beneficial in multiple factors-based multicriteria decision-making (MCDM)—also,violet SMART judgments. SMART (Simple Multi-Attribute Rating Technique) is a decision-making method for evaluating and comparing various alternatives based on several criteria. It's a more straightforward and intuitive alternative to more complex procedures like the Analytic Hierarchy Process (AHP).

M ukesh Nair, Prof. Amruta Chadawar, and Ashitesh B hosle(nd) studied An Efficient Divide and Conquered A pproach for Big Data Analytics in Machine Machine C ommunication. While studying, they propose a new effective, memory- and processing-efficient system architecture for Big Data in M2M, which, unlike other previous proposals, does not require alldata to be processed (including raw data sets) and kept in the main memory. Their architecture goes from physical objects to the processing servers, where the mechanismtransforms the Big Data set into several data blocks that can be quickly processed. Then, it classifies and reorganizes these data blocks from the same source. The paper presents a very general skeleton library that allows the parallelizationof any divide-and-conquer problem in hybrid distributedshared memory systems with little effort while providing much flexibility and good performance.

Modes of divide and conquer in computer technology

T here are two modes: prioritizing partitioning and prioritizing distribution.

Prioritizing Partitioning: Prioritizing partitioning involves breaking down a larger entity or problem into smaller, more manageable parts or partitions. Each partition is then handled separately, often with its own set of priorities. An example is computer programs that divide big data into small groups. Figure 1 clears this.

Prioritizing distribution involves allocating resources or tasks across different entities or components based on specific criteria or priorities. An example is assigning tasks to team members based on need and interest. Figure 1 clears this.

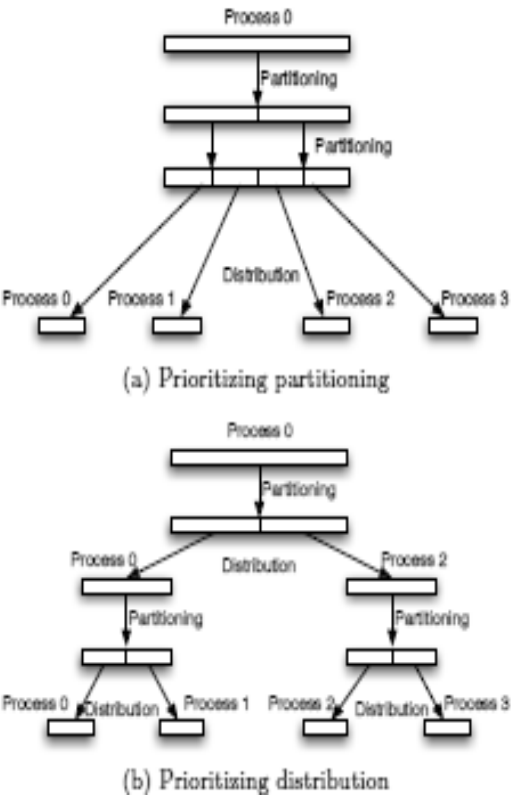

Figure 1: Prioritizing partitioning and prioritizing distribution

L arry Ruzzo gave some practical approachesto divide and conquer models. Reduce the problem to one or more sub-problems of the same type. Typically, each sub-problem is, at most, a constant fraction of the size of the original problem. Subproblems normally disjoint Often give significant, usually polynomial, speedup Examples: Binary Search, Mergesort, Quicksort (roughly), Strassen's Algorithm,

Philip II of Macedon's study on Divide and conquer found different sorting algorithms' time and space efficiency based on the divide and conquer algorithm.

Divide and conquer algorithm in computer application.

T he divide and conquer algorithm divides the whole into many pieces by making two halfs at the first stage. Both halvesare divided into halves repeatedly, creating a single unit to resolve them individually. This algorithm completes after merging all these elements into a single element.

T o discuss how the Divide and Conquer Algorithm is helpful and how we can use it to solve problems is displayed in Figure 2.

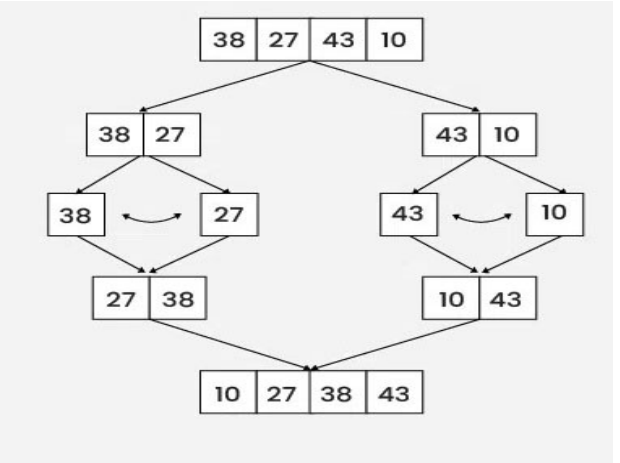

Figure2: divide and conquer algorithm

F igure 1 displays a list of on-ordered numbers. The problem is to order them. The figure in a DAC algorithm presents how it is requested.

S tandard Algorithms on Divide and Conquer Algorithm:

U nder the process of divide and conquer algorithm, the following algorithm come

- Binary Search
- Merge Sort
- Quick Sort
- Calculate pow(x, n)
- Karatsuba algorithm for fast multiplication
- Strassen's Matrix Multiplication
- Convex Hull (Simple Divide and Conquer Algorithm)
- Quickhull Algorithm for Convex Hull

O ne simple example of Calculate pow (x, n) is exemplified here with Python code.

```
# Python3 program for the above approach
def power(x, n):
    # initialize result by 1
    pow = 1
    # Multiply x for n times
    for i in range(n):
        pow = pow * x
    return pow
# Diver code
if __name__ == '__main__':
    x = 2
    n = 3
      # Function call
    print (power (x, n))
```

S ource: https://www.geeksforgeeks.org/write-a-c-program-to-calculate-powxn/

In this program, anybody can change the value to whatever they desire and check the results.

Business problems

B usiness problems are challenges or obstacles that o rganizations face while trying to achieve their goals, i mprove operations, or maintain competitiveness. These p roblems can arise in various areas, such as finance, operations, marketing, human resources, and technology. These problems vary widely, includingefficiency, resource a llocation, customer satisfaction, financial management, and strategic planning issues.

Common examples of business problems include:

1. Operational inefficiencies: Delays in production, supply chain disruptions, or process bottlenecks.
2. Financial issues: Cash flow problems, budgeting issues, or financial mismanagement.
3. Customer dissatisfaction: Poor customer service, product quality issues, or unmet customer needs.
4. Marketing challenges: Ineffective marketing strategies, low brand awareness, or declining sales.
5. Human resource problems: High employee turnover, lack of skilled workforce, or low employee morale.
6. Technological difficulties: Outdated technology, cybersecurity threats, or system integration issues.

T he **divide and conquer algorithm**is a powerful problem-solving technique that can be applied to address various business problems. Here's how it works:

D ivide: Break down the original business problem into smaller, more manageable subproblems. Each subproblem should represent a part of the overall issue. The goal is to divide the problem until no further division is possible.

C onquer: Solve each of the smaller subproblems i ndividually. If a subproblem is small enough (often c alled the "base case"), we solve it directly without further recursion. The goal is to find solutions for these subproblems independently.

M erge: Combine the subproblems' solutions to get the final solution for the entire business problem. Once the smaller subproblems are solved, we recursively combine their results to formulate a solution for the original problem.[6]

Applications of Divide and Conquer in Business:

Sorting: Merge Sort, a divide and conquer algorithm, efficiently sorts large datasets by breaking them down into smaller parts, sorting those parts, and then merging them.

Median Finding: Divide and conquer can efficiently find the median of a set of numbers by recursively dividing the set into smaller subsets.

Min and Max Finding: This technique can identify both the minimum and maximum elements in an array simultaneously by splitting the array into halves and comparing min-max pairs from each half.

Matrix Multiplication: Strassen's algorithm for matrix multiplication uses divide and conquer to reduce the number of multiplications required for large matrices.

Closest Pair Problem: Finding the two closest points in a set of points in a multidimensional space can be solved using divide and conquer[7]

Application of DAC in behavioral science

Psychologists suggest that individuals break down their complex problems like anxiety and tensioncaused by overburden into smaller manageable units so that it helps them form habits and adjust to situations. Institutions and teachers teach students to break complex subjects into small measurable sub-subjects and topics. This way, students can handle their subjects effectively.

Counseling psychologists advise clients to give up their negative habits one by one in order of importance so that a complete change of habits from bad to good takes place after several weeks and days.

Developmental psychologies like Jean Piaget and Erik Erikson developed their learning and development model with different characteristics, suggestingapplying the former stages to learn before later stages so that the learning takes place effectively.

Social psychologies and leaders follow divide-and-conquer rules to develop influence, such as conformity, obedience, and persuasion.

Groups and team developers in society follow specific group development processes to make the group mature and productive. Such processes are forming, storming, norming, adjourning, and performing [5].

Business organizations complete their tasksby applying the divide and conquer algorithm. Such divided tasks include: The first and foremost activity of the business is to identify the problem. Whether the issues relate to optimizing processes, optimizing resources, optimizing profit, increasing customer satisfaction, or any other challenges the business must meet, making the problems smaller to manageable is essential. The company writes that the main issues are first, followed by subproblems. Once the business identifies the difficulties and sub-problems,they are addressed individually and are to be addressed by different sections and units. These units also take actions based on the sorting of their importance and urgency. Here is the sorting algorithm.

In business, the problem arisesof allocating resources to perform the tasks, and bases of resource allocation take the form of sorting the tasks they have made. They apply merge and quick Sort, two sorting methods for the divide and conquer algorithm.

Organizations break total organization objectives into different sub-objectives of departments and down to individual levels. Each makes efforts to fulfill their goals, which is the integration of the organizational objectives.

The performance of each unit determines the overall performance of the organization. Each unit contributes to making the whole. If any unit is weak, the organization becomes weaker to that extent.

An organization's value chain is the application of a divide-and-conquer algorithm. In this competitive environment, competition, success, and sustainability are impossible until the organization administers and executes its value chain analysis.

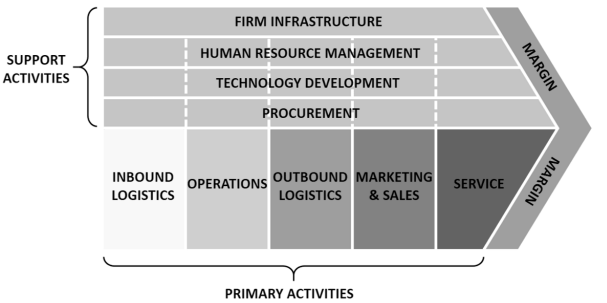

Figure 3: Value chain analysis of the business

Source: https://i0.wp.com/www.business-to-you.com/wp-content/uploads/2018/03/Value-Chain-1.png[8]

The linear responsibility chain is another example of organizations applying the divide and conquer algorithm.

Figure 4: Linear responsibility chart of the project

The two figures are only two examples of organizations breaking the total tasks and getting it done. Each relevant task of the organization is essential for the organization's overall success. Business organizations address each part of the tasks to be competitive and gain competitive advantages using appropriate technology and proper workflows.

Business performances are to be evaluated based on their targets and goals. Evaluation tasks must also be divided for each unit to see how effective these are.

Conclusions

Business application: Divide and conquer algorithm can solve many business problems, like data sorting and searching, market segmentations, project management., As these are the backbone of the business, appropriate data search contributes to market segmentation and consequently helps to execute the business decisions through project management.

Nonbusiness application: Divide and conquer is valuable for nonbusiness areas as this algorithm is the most fundamental. Classic algorithms like binary search (for searching in sorted arrays), merge Sort, quicksort (for sorting), and Strassen's algorithm (for matrix multiplication) are prime examples of divide-and-conquer applications. In areas such as numerical analysis and computational physics, divide-and-conquer algorithms help solve large-scale problems by breaking them down into smaller parts that can be solved more easily and accurately.Tasks such as parsing and text segmentation in natural language processing often employ divide-and-conquer strategies to break down sentences into smaller, more manageable parts for better analysis. Algorithms like the Fast Fourier Transform (FFT) are used in signal processing and image analysis. FFT, a divide-and-conquer algorithm, significantly reduces the computational complexity of performing Fourier transforms.

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Teaching and Learning with Technology: Effectiveness of ICT Integration in Institutional Schools of Nepal

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Abstract

Integration of Informati*on, Communication, and Technology (ICT) will assist teachers to the global requirement to replace traditional teaching methods with a technology-based teaching and learning tools and facilities. In Nepal, ICT is considered as one of the main elements in transforming the country to the future development. The Ministry of Education Science and Sports, through the sustainable development goals 4 – quality education ensure inclusive and equitable quality education and promote lifelong learning opportunities through ICT by 2030, insights the importance of technology-based teaching and learning into the schools' national curriculum. This study aims to analyze teachers' perceptions on effectiveness of ICT integration to support teaching and learning process in classroom. A survey questionnaire was distributed randomly to the total of 101 teachers' from10 institutional secondary schools in Kathmandu District, Nepal. The data for this quantitative research were analyzed for both descriptive and inferential statistic using SPSS (version 21) software. The results indicate that ICT integration has a great effectiveness for both teachers and the students. Findings indicate that teachers' well-equipped preparation with ICT tools and facilities is one the main factors in success of technology-based teaching and learning. . It was also found that professional development training programs for teachers also played a key role in enhancing students' quality learning. For the future studies, there is a need for consideration of other aspects of ICT integration especially from management point of view in regard to str*ategic planning and policy making.

Keywords: *ICT integration; Teaching and learning; Technology effectiveness; Education; Nepal, Sustainable development goals.*

Introduction

In this 21st century, the term "technology" is an important issue in many fields including education. This is because technology has become the knowledge transfer runway in most countries. Technology integration now-a-days has gone through innovations and transformed our societies that has totally changed the way people think, work and live (Grabe, 2007). As part of this, schools and other educational institutions which are supposed to prepare students to live in "a knowledge society" need to consider ICT integration in their curriculum (Ghavifekr, Afshari & Amla Salleh, 2012). Refers to the use of computer-based communication that incorporates into daily class room instructional process. In conjunction with preparing students for the current digital time, teachers are seen as the key players in using ICT in their daily classrooms. This is due to the capability of ICT in providing dynamic and practical teaching-learning environment (Arnseth & Hatlevik, 2012). While, the aim of ICT integration is to improve and increase the quality, accessibility and cost-efficiency of the delivery of coaching to students, it also refers to benefits from networking the learning communities to face the challenges of current globalization (Albirini, 2006, p.6). Process of acceptance of ICT is not a single step, but it is ongoing and continuous steps that fully support teaching and learning and in sequence resources (Young, 2003).

ICT amalgamation in education generally means technology-based teaching and learning process that closely relates to the utilization of learning technologies in schools. Due to the fact that students are familiar with technology and they will learn better within technology-based environment, the issue of ICT combination in schools, specifically in the classroom is vital. This is because; the use of technology in education contributes a lot in the pedagogical aspects in which the application of ICT will lead to effective learning with the help and supports from ICT elements and components (Jamieson-Procter et al., 2013). It is right to say that almost all ranges of subjects' starts from mathematics, science, languages, arts and humanistic and other major fields can be learned more effectively through technology-based tools and equipment. Besides, ICT provides the help and complementary supports for both teachers and students

where it involves effective learning with the help of the computers to serve the purpose of learning aids (Jorge et al., 2003). Computers and equipment does not acts

As a replacing tools for quality teachers but instead they are considered as an add-on supplements needed for the better teaching and learning. The need for ICT combination in education is vital, because with the help of technology, teaching and learning is not only happening in the school environment, but also can happen even if teachers and students are physically in distance. However, ICT integration is not a one-step learning process, but it is a repeated process of learning that provides practical teaching-learning environment (Young, 2003).

ICT can be used in various ways where it helps both teachers and students to learn about their respective subject areas. A technology- based teaching and learning offers various interesting ways which includes educational videos, stimulation, storage of data, the usage of data bases, mind-mapping, guided discovery, brainstorming, music, World Wide Web (www) that will make the learning process more fulfilling and meaningful (Finger & Trinidad,2002).On the other hand, students will benefit from ICT integration where they are not bounded to the limited curriculum and resources, instead hands-on activities in a technology-based course is designed to help them to stimulate their understanding about the subject. It also helps teachers to design their lesson plans in an effective, creative and interesting approach that would result in students' active learning. Previous researches proved that use of ICT in teaching will enhance the learning process and maximizes the students' abilities in active learning (Finger & Trinidad, 2002; Jorge et al., 2003; Young, 2003; Jamieson-Procter et al., 2013).

Hermans, Tondeur, Van-Braak, and Valcke(2008) have identified three main stages for ICT to be highly valued and regarded by the teachers; integration, improvement and harmonizing. Integration approach is about implementing right use of ICT in particular subject area that involved complex concepts and skills to improve student's achievement and attainment. Besides, the review of curriculum is also needed so that only related ICT resources and appropriate software will be installed for the main aims and objectives of curriculum to be achieved. Enhancement approach is about using ICT to give great emphasis on the topic introduced. For instance, Microsoft PowerPoint can be used to present the topic in a very innovative and creative way that will lead into discussion and exchanging ideas and thoughts. Finally, complementary approach is when the ICT is used to aid and support the student's learning. This approach allow students to be more organized and efficient in which they can take obtain the notes from computer, submit their works by email from home as long as they meet the deadline and looking for information from various sources provided online to fulfill the task given to them (Hermans et al., 2008) .

Technology-based teaching and learning can make many changes in school that requires for proper planning and policy making. Researchers and policymakers must both have the same insight about the future plan. Pant (2010) noted that national ICT policies can serve several crucial functions. They provide a rationale, a set of goals, and a vision of how education systems run if ICT is integrated into teaching and learning process, and they are beneficial to students, teachers, parents and the general population of a given country. Ministry of Education & sport Nepal has formulated three main policies for ICT in education. The first policy insists on all students are given opportunity to use ICT. This is aimed to reduce the digital gap amongst the schools. The second policy focuses on the role and function played by ICT in education. Besides that, another policy stressed on the use of ICT for accessing information, communication and as productivity tool (Pant, 2002).

However, infrastructure and facility of ICT is then needed to supply to the schools throughout the nation. A key factor in use of ICT is sufficient computer labs and ICT equipment. This is to ensure that subject teachers are easily access to ICT tools whenever needed (Hennessy, Ruthven, & Brindley, 2005). Lack of adequate ICT equipment and internet access is one of the key problems that schools specifically in rural areas are facing now. For example, results of a research show that in Nepal, some schools have computer but this could be limited to one computer in the office only. Even in schools with computers, the student-computer ration is high. In addition, the report continues revealed that the schools with ICT infrastructure are supported by parents' initiative or community power (Chapelle, 2011).

In most schools, technical difficulties sought to become a major problem and a

Source of frustration for students and teachers and cause interruptions in teaching and learning process. If there is lack of technical assistance and no repair on it, teachers are not able to use the computer for temporarily (Jamieson-Proctor et al., 2013). The effect is that teachers will be discouraged from using computers because of fear of equipment failure since they are not given any assistance on the issue. Türel and Johnson's study (2012) revealed that technical problems become a major barrier for teachers. These problems include low connectivity, virus attack and printer not functioning. However, there are a few exceptions. Schools in the countries like Nepal, India,

Bhutan and Sri-Lanka have recognized the importance of technical support to assist teachers to use ICT in the classroom (Yang & Wang, 2012).

In addition, teachers' readiness and skills in using ICT are playing essential role in the use of ICT in education. Teachers need sufficient ICT skills to implement the technology and to have high confident level to use it in a classroom setting. Besides, teachers require insight into the pedagogical role of ICT, in order to use it meaningfully in their instructional process (Hennessy et al., 2005). According to Winzenried, Dalgarno and Tinkler (2010) teachers who have gone through ICT course are more effective in teaching by using technology tools as opposed to those that have no experience in such training. A school in Ireland reported that teachers who did not develop sufficient confidence avoided using ICT. Similar case happened in Canada, some teachers admitted they were reluctant ICT users because they worried they might get embarrassed that the students knew more about the technology than they did (Hennessy et al., 2005).

Beyond basic skill training, schools had used a variety of strategies to provide further professional development for teachers. According to Warwick and Kershner (2008) the significance and advantages of ICT should be known by teachers in order to conduct a meaningful lesson with the use of ICT. Indeed, teachers should be sent to attend training courses to learn about integration ICT in teaching and learning process. Nonetheless, many school schools used peer-tutoring systems. A more skillful teacher in ICT would assist and guide another teacher who has less experience with ICT along the preparation work for teaching and learning process. As what has been discussed, there are many factors to enable the use of ICT in classroom teaching and learning. Begin with policy, follows by the supplement of all the ICT hardware and software facilities, continued by readiness and skills of teacher to integrate it into pedagogical process (Agbatogun, 2012).Besides, technical support and continuous professional development in ICT should be conducted from time to time. In short, all parties must cooperate in order to bring the nation to become a country advance in technology.

The main purpose of this study is to analysis the effectiveness of ICT integration in. Specifically, this study aims to identify; (I) the effectiveness of I CT integration form teaching and learning perspectives and (II) the effective elements of ICT integration in teaching in institutionschools in Nepal.

Teachers 'Belief on Technology-based Teaching and Learning

With the development of learning technologies in the late 20th century, education system has changed rapidly. This is due to the capability of technology to provide a proactive, easy access and comprehensive teaching and learning environment. Nowadays, Ministry of education in all over the world has provided a lot of facilities and training in order to enhance the use of advanced technologies in the countries' teaching and learning process. A high budget has been placed in order to provide the equipment needed by teachers to improve the education system. Despite all the efforts, most of the countries are facing similar problem whereby the teachers are not maximizing the usage of the technology provided (Albirini, 2006). This has become a serious matter as many previous researches have proven the usage of ICT in teaching and learning process could improve students' achievement (Nakayima, 2011, Jamieson-Proctor et al., 2013).Many, researchers have taken an effort to analyse the factors that affecting teachers' acceptance of ICT usage in the classrooms (Capan, 2012; Virkus, 2008; Zhang, 2013; Dudeney, 2010). It shows that, the major barrier of the implementation was the teachers' belief as the teachers are the person who implements the change in their teaching and learning process. Moreover, previous research (Cassim & Obono, 2011) shows that the correlation of teachers' belief and the use of ICT are high. Teachers' role is getting more important especially in usage of ICT in pedagogy which could increase the achievement of the students, their creativity and thinking skills.

Results of a previous research (Cox & Marshall, 2007) shows that teachers only need a traditional – centered approach when developing ICT skills in the classroom. The teachers are having high confidence and competency in using ICT in classroom even though it does not represents the types of ICT used. This is because they believe that ICT is a tool could help in learning process especially to relate with real life practices. This factor has reform the teaching method to integrate ICT in order to create and construct knowledge for the students. The research shows that the relationship between competency and confidence could reflect the

Balances between training and pedagogically focused approaches in ICT professional development. With this, the school management could make sure that there are sufficient supports for the teachers to integrate ICT in the classroom.

However, teachers' efficacy in urban schools changes as the years of experience of working and age of teachers (Cuban, 2001). It shows that the teachers' efficacy are decreasing as the years of experience and age increases but somehow the decrease and the efficacy belief depend on the school management. School management here means the opportunities for collegial interaction, and the use of the instructional resources. Schools that could provide opportunities for teachers to reflect on teaching and learning with their colleagues and for administrators and teachers to collaborate and communicate, as well as support the use of instructional resources. From this

research, the teachers efficacy belief is depend on the school management and culture. Therefore, if the school has always implant the culture to change and teachers are always sent for training for upgrading themselves, and then the integration of ICT in classroom will be easier to be enhanced in the classroom.

The main goal of ICT implementation in education proclaimed the vision and missions of the government to promote ICT in education for the following intentions:

1) To surround schools with dynamic and innovative learnin environments for students to become more motivated and creative;
2) To enable students to gain wider range of knowledge and be able to access to internet for developing a global outlook;
3) To nurture students with capabilities of processing in formation more effectively and efficiently; and
4) To develop students with attitudes and capability of life-long learning

The new preriod of ICT in education should be developed rapidly to appropriate extent in order to matching the capability of students as well as teachers in educational experience due to the development of new information technology. Results of a study by Abd Rahim and Shamsiah (2008) suggest that trainee teachers in Nepal have confidence to integrate ICT in their teaching practices. And the male teachers are more confident than female teachers in using ICT integration in teaching. More over it shows that vocational teachers are more

Confident to integrate ICT in teaching, because they can handle technical subjects and their experience enable them to integrate ICT effectively in teaching (Abd Rahim & Shamsiah, 2008; Yunus, 2007). Furthermore, only minority of teachers in Nepal professionally know the basic of ICT. The majority of them just had average knowledge in ICT, and even a group of the teachers are poor in the related knowledge of ICT in Nepal (Rosani &Mohd Arif,2010).It indicates that level of ICT knowledge among teachers is one of the key factors for Nepal society to make successful adoption of ICT in its education.

The Conceptual Framework

For the purpose of this study in ligh of ICT integration to enhance a quality teaching and learning experience in schools , two theories of Diffusion of Innovations by Rogers (2003) and Technology Acceptance Model (TAM) by Davis (2003), has been identified and adapted to the research setting as the conceptual framework for this research (Figure 1). Rogers's theory stated as the process by which an innovation is communicated through certain hannels and over time among the members of a social system. The process will starts with "knowledge" of the first channel that represents characteristics of the decision making unit by the ICT users in order to integrate the technology. And it ends with "confirmation" by the users to accept the technology and integrate it accordingly. The TAM theory comprises of various parts which is representing the process of ICT acceptance by the users including; behavioral intension, perceived usefulness and perceived ease of use. While, perceived usefulness refers to the degree to

which person believes on the benefit from the use of a particular technology by improving the job performance, perceived ease of use refers to the importance of a technology in being user- friendly for the users. Generally, TAM theory was developed to measure the effectiveness or success of a technology in helping understanding the value and efficacy of a particular system. It is also considered as one of the most influential theories in contemporary information systems research. However, the theory has evolved with more specific variables explaining how a user can accept a technology over the years.

The proposed frame work includes various factors directly associated with the core aim of the study that explains how knowledge and perceptions will affect the perceived usefulness and ease of use of ICT integration. The factors embedded in the conceptual framework have been meticulously interlaced, so that the interrelationship among them constitutes to measure their effectiveness on ICT integration by teachers. However, intension to integrate ICT by teachers is the main variable that supports the key elements in the above framework such as ease-of-use, functionality, flexibility, accessibility and integration. In addition, the intention of teachers to use the technology is strongly influenced by their perceptions on usefulness of the system as well as perceived ease of use and determines their actual use of ICT. The proposed framework has guided this research in investigating the factors affecting

Method

Research Design

In this research, quantitative methodology was used to collect and analyze the data obtained from all the respondents. The researchers developed the questionnaire and finalized it before being distributed to the targeted group of respondents. Few sections on the questionnaire were designed specifically to address research

Objectives in regard with the effectiveness of ICT integration for students in learning and effective elements of ICT integration in institutionschool in KathmanduTherefore, the questionnaire was distributed to obtain the data from the respondents.

Population and Sampling

The overall total of respondents for this research was 101 teachers from institutional primary and secondary schools in Kathmandu. The questionnaire was randomly distributed to the respondents with teaching background

regardless of gender, race, teaching experience as well as highest teaching experience. There are no preferences set by the researchers as long as the respondents come with teaching background especially in institutionprimary and secondary school in Kathmandu. Since the targeted respondents for this research are meant for individuals with teaching background, the researchers tried to get especially teachers from institutionprimary and secondary schools in Kathmandu to be part of this research. Hence, the questionnaires distributed are not equal in numbers where teachers from secondary schools dominate the overall population as compared to teachers from primary schools.

Instrument

A survey questionnaire with a total of 43 items was used as the main instrument in this study to analyze the effectiveness of ICT integration in teaching and learning in institutionschools in Kathmandu. A total of 101 questionnaires were distributed where all respondents were asked to read the statements given and choose their answers based on 4-Likert scale ranged from 4= Strongly Disagree, 3= Disagree, 2= Agree and 1= Strongly Agree. The questionnaires consisted of 4 sections. Section A is about the demographic background of the respondents consists of 8 items that includes gender, race, teaching experience, type of school, school area, preference of teaching style, highest academic qualification and the ability of handling ICT in teaching. The other 3 sections in the questionnaire focus more into teacher's perception and the elements of effectiveness of ICT integration in schools. Section B comes with 15 items that looks into teacher's perception of ICT in teaching, section C consists of 10 items that looks into the effectiveness of ICT integration for students in learning meanwhile section D comes with 10 items that looks into the effective elements of ICT integration in teaching. The questionnaire used for this quantitative study was adopted and modified from the original questionnaire designed by Gulbahar and Guven (2008) that is considered suitable for this research. Some of the items are designed and developed by the researchers accordingly with the title chosen so that the items developed are able to provide the answers needed for both research questions.

Data Collection Procedure

The researchers modified the questionnaire before it is being finalized and distributed to the target group of respondents. Then, each researcher takes up 50 and 51 questionnaires respectively that made a total of 101 questionnaires being distributed to all respondents. The data was collected within 2 weeks through random distribution and some of the questionnaires were sent to respondents email. The respondents were given 3-5days to complete the questionnaire and send it back to the researcher for data analysis. After 2 weeks, all the complete filled-up questionnaires were gathered and collected for further data analysis by the researcher to get the output and findings for the research.

Data Analysis Process

All the data collected from the respondents were gathered together to be analyzed using Statistical Package for the Social Sciences (SPSS) version 21. The analysis includes both descriptive and inferential analysis. The researchers used descriptive analysis to analyze the frequency and percentage of the overall population in the demographic background. Besides, it is also used to determine the mean, standard deviation, frequency and percentage to identify the effectiveness of ICT integration for students in learning as well as the effective elements of ICT integration in teaching in institutionschools in Kathmandu.

Discussion and Conclusion

The results of this study show that technology-based teaching and learning is more effective in compare to traditional classroom. This is because, using ICT tools and equipment will prepare an active learning environment that is more interesting and effective for both teachers and students. The results are in line with a research findings by Mahato (2005) that proved using ICT in education would enhance students' learning. However, most of teachers in this study agree that ICT helps to improve classroom management as students are well-behaved and more focused. Moreover, this study proved that students learn more effectively with the use of ICT as lesson designed are more engaging and interesting. Accordingly, the participants agreed that integrating ICT can foster students' learning.

Results of a study by Mahato(2013) show that the Internet Use in EFL Teaching and Learning in institutional school in Kathmandu and the findings indicated that teachers have positive attitude regarding the use of Internet in teaching and learning; teachers have some knowledge about Internet use in teaching and learning; they have not well integrated Internet into teaching and learning so far; teachers' knowledge about ICT and network technology is very limited. Likewise, the first two points were similar to the findings of this research, which most of teachers think ICT integration for students in learning is effective. Because students can develop the confidence to have better communication and able to express their thoughts and ideas; ICT helps students to be more creative and Imaginative as their knowledge paradigm expend; and ICT helps students to possess all four skills in learning when they are able to acquire necessary information and knowledge. However, this study finds that institutionschool teachers in Kathmandu, Nepal are not given enough time to learn and be comfortable with ICT.

In compare to a study conducted by Thapa (2011) that shows most of pre-service teachers indicated that they only implicate elementary ICT tools for educational use , this study found that most teachers think ICT integration

is effective, but ICT tools provided in school are not enough nor in good condition; training and professional development are not adequately provided for teachers; technical supports are somehow provided but can be improved from time to time; and not very good condition of computer lab in school with well- functioning tools and facilities.

In conclusion, the very first stage of ICT implementation must be effective to make sure that, teachers and students are able to make the best use of it. Thus, preparations of a technology-based teaching and learning begin with proper implementation and supports by the school top management. If the implementation process of technology integration in schools take place appropriately from the very beginning stage and the continuous maintenance are adequately provided, ICT integration in schools will result in a huge success and benefits for both teachers and students. The use of ICT especially in teaching and learning is more about practicality as compared to theories and that is why teachers must be given time to learn and explore it, face the "trial-and- error" phase before they are completely comfortable with its usage and able to make use of it for teaching and learning.

Finally, the integration of ICT in classroom needs serious consideration in order to increase the competency of the country's education system. This will help in increasing the world ranking of the national education and produce the better future work force. In order to enhance the use of ICT in classroom, the government needs to improve and change the teachers' belief about the integration of ICT in classroom. As the teachers' role is the key role in making any of the new policy to be implemented efficiently and successfully. The changes that is taking place is driven by advanced technology and communication devices that should be available to students where school or home. In addition, the needs for teachers to be literate and have good skills and knowledge in using ICT to improve their teaching methods and approach is desired to promote effective learning as well as to meet the demand of the 21st century teaching skills.

Recommendations

It might be too common for issues and challenges of ICT integration to be discussed but in-depth study of ICT integration in core subjects in schools is

least discussed. It is good if further studies can be made based on what barriers teachers are facing in using ICT in their daily classrooms in schools. Besides, rather than just focusing in institutionschools, it is best if this study can be conducted in 3 major schools we have in Nepalthat includes institutionschools, Chinese school as well as Indian school. This is because some schools might have more funding that makes ICT implementation much faster and easier. It is good if comparison can be made between different schools in which it can take the good side as examples and make improvements needed from the flaws identified.

Other than that, it is highly recommended for comparison studies about ICT integration in teaching and learning to be done between institutionand private schools. This is because most private schools permit students to bring gadgets to school and teaching and learning process takes place within the use of ICT. It would be exciting to see the findings between the effectiveness of ICT integration in institutionand private schools.

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Uses of Education Management Information System (EMIS) in Universities of Nepal

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This article examines the current state and potential of Education Management Information Systems (EMIS) in Nepalese universities, focusing on the landscape of 17 national and provincial universities. The COVID-19 pandemic served as a catalyst, pushing universities to adopt online learning and highlighting the critical role of information technology in streamlining university operations. However, significant challenges impede the widespread adoption of EMIS solutions. These include:

- **Technophobia:** A reluctance or fear of technology use is prevalent among some faculty members and administrators. This can hinder their willingness to learn and utilize new EMIS functionalities. exclamation
- **Limited IT Resources:** Reliable internet connectivity and access to laptops or other computing devices are crucial for effective EMIS implementation. Unfortunately, many universities lack the necessary infrastructure and resources, creating a barrier to successful system integration.
- **Data Reliability Concerns:** The data provided by the University Grants Commission (UGC) on student enrollment and academic programs has raised questions about its accuracy.exclamation This lack of reliable data undermines informed decision-making within universities and underscores the need for robust EMIS solutions that can ensure data integrity.exclamation

However, implementation of EMIS system in highly ranked universities was from earlier time but in Nepal adoptation of these technique and technologies are in crawling practise. The concept of practising the new system and technology is mandetory but trained human resources, intrgrated data centre, secure intregrated data system and, government policies might be the greatest challenges.

- **Office Automation Systems:** These systems can streamline administrative tasks like student registration, fee collection, faculty workload management, and communication. This not only enhances efficiency but also frees up valuable time for staff to focus on other critical areas.
- **Learning Management Systems (LMS):** LMS platforms provide a centralized online environment for course delivery, resource management, student engagement, and assessment.expand_more They offer significant benefits for both online and blended learning models, promoting flexibility and accessibility for students and faculty alike.

By implementing these and other EMIS solutions, universities can achieve a multitude of improvements:

- **Enhanced decision-making:** Reliable data gathered through EMIS empowers university leadership to make informed decisions regarding resource allocation, curriculum development, and strategic planning.

- **Improved student services:** Streamlined administrative processes with EMIS can lead to faster response times to student inquiries and ensure a more efficient experience for students throughout their academic journey.
- **Increased efficiency:** Automating repetitive tasks through EMIS frees up faculty and staff time, allowing them to focus on more strategic initiatives and student interaction.
- **Greater transparency and accountability:** Accurate and readily available data allows for improved transparency within the university system, fostering better communication and accountability towards stakeholders.

Keywords: *Education Management Information System, IT, data management system, academic system, challenges accounatability of ti's uses.*

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Enhancing Digital Competence for Public Servants: A Framework for the Digital Platform Government

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Abstract

This study addresses the necessity of digital competence for public servants within the framework of the Digital Platform Government. It aims to diagnose, measure, and analyze public servants' digital competence, developing and validating a specific indicator system. Using literature reviews, case studies, and expert interviews, the study establishes key digital competence areas such as digital leadership, data competence, AI competence, and digital ethics. The analysis includes current educational programs and highlights the need for improved training in digital ethics and bridging the digital divide. The developed indicators and self-assessment tools provide a basis for targeted training programs. The study underscores the importance of measuring digital competence to enhance public servant capabilities, informing education, job appointments, and promotions to improve government efficiency and the success of the Digital Platform Government.

1. Introduction

The Digital Platform Government aims to establish a vision and goals centered on digital fundamentals, such as a unified government, an intelligent government for individuals, a growth platform involving both the public and private sectors, and the realization of a trustworthy and secure digital platform government. The digital competence of public servants is essential for the Digital Platform Government. It is crucial to precisely define, diagnose, and measure the competence necessary for integrating and utilizing digital platforms by public servants. This study aims to diagnose, measure, and analyze the digital competence of public servants, and based on this, develop and validate a digital competence indicator for public servants to systematically design and implement necessary digital competence education.

This study establishes a digital competence indicator system for public servants through literature reviews, case studies, expert interviews, and stakeholder interviews, analyzing the results to derive policy recommendations. The strategy includes reviewing existing domestic and international research on digital competence, gathering expert opinions, and utilizing the Delphi technique to derive digital competence indicators. The derived indicators are then validated for objectivity and applicability through meetings with stakeholders and experts.

2. Concept of Digital Competence

Digital competence refers to the essential skills required by citizens in the rapidly transitioning digital era. It encompasses the political goals and expectations of citizens in a knowledge society, cognitive and socio-emotional abilities, and technology-related skills. Various terms such as 'digital competence,' 'data competence,' and 'digital literacy' are used interchangeably. Therefore, prior research on digital competence, digital literacy, and their sub-factors is conducted. Digital competence includes a wide range of areas, from device operation to creative thinking skills, problem-solving skills, information and data skills, and critical thinking skills.

3. Literature Review

The Seoul Digital Foundation defines digital competence as digital awareness, digital communication, digital citizenship, understanding of the digital society and establishment of self-identity, understanding and utilization of digital technology, and management and utilization of information and content. The areas related to digital competence and digital literacy for the general public are adapted to fit the duties and characteristics of public servants in the development of competence indicators.

General definitions of digital literacy have limitations in encompassing the competencies required in the public sector, necessitating research on the digital competence of public servants rather than the general public.

To derive digital competence indicators for public servants, preceding studies are analyzed, and the concepts presented in the research are adopted. Managers and practitioners have different job characteristics and the digital competencies required by these characteristics are different. This study reflects these differences in the development of differentiated digital competence indicators.

3. Development of Digital Competence Indicators for Public Servants

External experts validated the appropriateness of the competence indicators for managers and practitioners. This study maintained the structure of the digital competence indicators developed over three phases to derive the final version.

Considering the job characteristics of public servants, the study developed four types of competence indicators: digital competence indicators for managers, non-digital competence indicators for managers, digital competence indicators for practitioners, and non-digital competence indicators for practitioners.

To enhance the efficiency of the competence diagnosis survey for public servants conducted by the personnel planning office, the study developed eight additional versions of the questionnaire, including both long and short versions.

The study identified 63 indicators in common areas such as digital leadership, data competence, AI competence, and digital ethics competence for managers. Additionally, 15 questions were developed for advanced areas such as advanced data utilization competence, advanced AI competence, and advanced digital ethics competence. For practitioners, the study identified 60 indicators in common areas such as digital leadership, data competence, AI competence, and digital ethics competence. Additionally, 10 questions were developed for advanced areas such as advanced data utilization competence, advanced AI competence, and advanced digital ethics competence.

The evaluation results of digital competence are divided into three levels: [Competence Level 1], [Competence Level 2], and [Competence Level 3]. These levels apply to both managers. The digital competence training program for managers can include digital literacy, digital leadership, digital policy management, digital-based communication and organizational management, and digital ethics. The digital competence training program for practitioners can include digital literacy, digital leadership, digital policy management, digital-based communication and organizational management, and digital ethics. The results of the competence measurement can be reflected in job specification, the selection process for public servant educational resources, and other relevant processes.

4. Conclusion

The success or failure of the Digital Platform Government hinges on the digital competence of the public servants who implement and manage the digital platform. The most crucial foundation for enhancing the digital competence of public servants is the measurement of their digital competence. This study began with the consideration of how to measure the digital competence of government employees and proposed a framework based on efforts to measure digital competence both domestically and internationally.

The results of measuring the digital competence of public servants can be used as a reference for public servant education and training, job appointments, and promotions. By selecting and training suitable talents, assigning them to appropriate positions, and promoting them, the efficiency of government resources can be improved.

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Assessment of Factors Affecting Labor Productivity in Road Construction Projects

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Abstract

Efficient labor productivity is integral to the construction industry. This research investigates labor productivity within road construction projects. The study employs a comprehensive approach, combining primary data from surveys and observations with secondary data. A well-structured Likert scale five-point questionnaire, administered to eighty-three randomly chosen respondents, reveals that labor experience, remuneration, material availability, supervision, and weather conditions are the most important factors influencing productivity. The research emphasizes the necessity for task-specific strategies due to notable variations in productivity between skilled and unskilled labor. Competitive payment, resource allocation, scheduling, inventory management, standardized design, financial planning, and break-time provision emerge as critical factors in enhancing productivity. The study emphasizes the multifaceted nature of addressing these aspects for improved efficiency and timely project completion. Moreover, the absence of universally recognized indicators highlights the need for standardized metrics in the construction sector to comprehensively assess labor productivity. The research provides valuable insights, advocating for optimized construction processes and resource utilization to enhance overall efficiency in road construction projects.

Keywords: *Labor productivity; Road construction; Improved productivity*

1. Introduction

In developing countries like Nepal, where the construction industry is mostly labor-intensive, the significance of understanding and managing labor productivity is vital. Construction site productivity is crucial for the completion of projects within timeand cost, ensuringtheir success and efficiency (Montaser et al., 2018)frequency and severity of project delay factors that affect the construction labor productivity for construction of Pre-stressed concrete bridges. Design/erection / methodology: A total of 50 respondents consisting of owners contractors, and consulting participated in this study. The respondents were asked to indicate how important each item of a list of many bridges project related factors was to construction labor productivity for construction of Pre-stressed concrete bridges. The data were then subjected to the calculation of important indices which enabled the factors to be ranked. Findings: The eleven most important factors identified by them were: design factor, equipment factor, execution and construction factor, external factor, financial factor, healthy and safety factor, labor factor, supervision factor, material factor, organization factor and other project factor. Originality/value: From this study could be used by the project managers to take these factors at an early stage, hence minimizing the time, cost and maximizing factors that affect the construction labour productivity for construction of Pre-stressed concrete bridges.",.Systematically measuring and monitoring labor productivity on schedule ensures efficient resource use and timely project completion (Alaloul et al., 2021) primarily in labour productivity. This research focuses on the factors affecting labour productivity in road construction projects of Pakistan. A questionnaire was developed to observe the impact of critical factors on labour productivity. Based on the gathered responses, the factors were ranked using the Relative Importance Index (RII.To achieve projected construction project earnings, efficient management of interlinked elements like workforce, machinery, and finances is crucial (Mengistu et al., 2016). Effective construction resource management enhances productivity, resulting in time and cost savings (Ghate et al., 2016).Labor productivity, influenced by working conditions, management quality, and technology (Maarof and Easeph, 2017), is critical for project success. Focused efforts in key areas optimize outcomes, ensuring efficiency and timely completion (Soekiman et al.,

2011). Workforce expertise drives company performance and competitiveness, yielding a distinct advantage (Mtotywa and Lalose, 2023). Improving productivity entails enhancing worker efficiency and effectiveness, and recognizing the necessity to meet established quality standards.

Measuring productivity in construction diverges from other sectors due to the qualitative nature of labor productivity (Alina & Wilfred, 2016). Labor productivity operates in a complex and unpredictable environment, surpassing the challenges of the translation process itself. Prioritizing the identification of Critical Learning Pathway (CLP) parameters is crucial for accurate modeling, incorporating both subjective and objective elements (Arnaud, 2019). As a fundamental economic variable, productivity governs the efficiency of production activities. Businesses aim to enhance productivity strategically, efficiently converting resources into marketable products, ultimately determining profitability (Karimi & Gidado, 2012). Top of Form

A nation's capacity to elevate its standard of living depends largely on its ability to increase output per worker (Krugman, 1995). Productivity, defined as the output-to-input ratio, signifies the efficiency of resource utilization in production embracing machinery, tools, land, materials, and manpower (Palop, 2016). Elevating productivity occurs when more output is achieved with the same input or when the same output is attained with a reduced input. If input scales proportionally with output, productivity remains constant. In the construction industry, irrespective of size, labor productivity is pivotal. Organizations must analyze and recognize factors impacting it, implementing measures for enhancement (Elazzazy, 2020). Labor productivity can be influenced by unforeseen events and variables, including work-related factors, contributing to cost and time overruns in construction projects (Katta, 2023). Attentive analysis and proactive measures are imperative to mitigate such challenges and ensure project success.

Presently, global investment in infrastructure projects is crucial to the world economy, amounting to around $10 trillion annually, and is projected to reach $14 trillion by 2025 (Barbosa et al., 2017). However, the industry faces challenges in optimizing this investment due to lower productivity levels. In construction, productivity is commonly measured in terms of labor productivity, representing units of work completed per man-hour (Thiyagu and Dheenadhayalan, 2015). Unsatisfactory project outcomes are often attributed to productivity issues, primarily linked to workforce performance (Latief et al., 2023). Enhancing productivity is seen as the key to addressing industry challenges and driving national prosperity (Rane et al., 2017). Continuous improvement in construction productivity is crucial for contributing meaningfully to national economies.Labor productivity, a vital index in the construction industry, can be enhanced through understanding and addressing factors influencing efficiency (Ghate et al., 2016). Strategies to reduce inefficiencies and enhance workforce management can not only improve the performance and competitiveness of construction companies but also increase their chances of survival in a highly competitive environment (Nor et al., 2023).

Improved labor productivity not only benefits companies but also employees. It can lead to increased income, and improved workplace conditions, contributing to higher job satisfaction and motivation among workers (Toha et al., 2013). It is important to construction planning efforts and has a direct impact on the triple constraint of time, cost, and quality (Ghate et al., 2016). It is a foundational element in project cost estimations and serves as a benchmark for performance assessment (Chigara & Moyo, 2014). Successful construction projects, characterized by timely completion, budget adherence, quality standards, and safety protocols consistently achieving planned levels of productivity. However, the persistent challenge of low productivity remains prevalent in the construction sector (Bamfo-Agyei et al., 2019). Recognizing the vital role of productivity growth in the survival of construction businesses, there is an urgent need to address and enhance productivity in the industry (Adebowale & Agumba, 2022). The construction industry in developing countries like Nepal faces lots of challenges about problems associated with productivity. Therefore, the researchers focus on assessing labor productivity in road construction projects in Nepal.

2. Materials and Method

This study employed a comprehensive research approach combining site visits, structured questionnaires, and Key Informant Interviews (KII) for data collection. The integration of both quantitative and qualitative methodologies aimed at providing a holistic understanding of the factors influencing labor productivity in road construction projects. The quantitative component involved systematic numerical data collection, complemented by observations and questionnaire surveys. Concurrently, qualitative information was gathered through a literature review and interviews with key informants. The research focused on the Tanahun district in the Gandaki province of Nepal, covering an area of 1,546 square km. Thirteen road construction sites were selected for in-depth analysis to determine factors affecting labor productivity and identify strategies for improvement. These construction sites involved various stakeholders, including consultants, engineers, workers, and contractors. For the questionnaire survey eighty-three personnel with significant experience from thirteen road construction projects were chosen, including engineers (25), contractors (13), consultants (6), and workers (39) with over five years of experience. A pilot study, involving 5% of the total population, was

conducted to refine the questionnaire, ensuring clarity and unbiased responses. The research questionnaire was developed based on literature reviews and expert inputs. Cronbach's alpha was calculated to validate the reliability of the research questionnaire. Statistical tools, including the Relative Importance Index (RII), were employed to analyze the collected data.

3. Result and Discussion

Cronbach's Alpha, on a scale from 0 to 1, assesses a questionnaire's internal consistency, with higher values indicating greater reliability. It is deemed excellent if more than 0.9, good between 0.8 to 0.9, acceptable from 0.7 to 0.8, and questionable within 0.6 to 0.7. Poor reliability falls between 0.5 to 0.6, while values below 0.5 are considered unacceptable (Sharma, 2017).The Cronbach's Alpha values for assessing the manpower factor affecting labor productivity in this study indicate a good level of internal consistency with a Cronbach's Alpha value of 0.844. The indicators Attitude, Age of labor, Personal problems of labor, Alcoholism, Absenteeism, Labor Experience, and skill have Cronbach alpha values of 0.797, 0.804, 0.844, 0.794, 0.813, and 0.845 with internal consistency of acceptable, good, good, acceptable, good and good respectively. Motivation factor affecting labor productivity has a Cronbach's Alpha of 0.863, this factor is considered good in terms of internal consistency. Its indicators Timeliness of remuneration, Reward/ punishment, Amount of Remuneration, Training facilities/ session, Recognition, and Appreciation have a Cronbach alpha value of 0.861, 0.805, 0.829, 0.827, and 0.846 respectively with the internal consistency of all indicator good. The resource factor affecting labor productivity has a Cronbach's Alpha value of 0.845, which falls within a good range of internal consistency. When examining individual indicators, Increase in the price of material, Lack of construction material, Unsuitability of materials storage location, Lack of construction tools and equipment, and Poor access within the construction site have Cronbach alpha values of 0.791, 0.839, 0.816, 0.826, and 0.792 with the internal consistency of acceptable, good, good, good, acceptable respectively. The project factor affecting labor productivity demonstrates a good range inconsistency, with an overall Cronbach's Alpha value of 0.848. When looking at specific factors, Multiple sources of commanding, Project location, Project manager's leadership, Lack of supervision, Client intervention, and Structural Design complexity have the internal consistency of good, good, acceptable, good, good, and good with Cronbach alpha value of 0.807, 0.828, 0.798, 0.878, 0.812, and 0.799 respectively. Miscellaneous factor affecting labor productivity has a Cronbach's Alpha of 0.920, this factor is considered excellent in terms of internal consistency. Its indicators of weather condition, Working overtime, Break time, Social culture, and Economic condition have Cronbach alpha values of 0.924, 0.887, 0.889, 0.914, and 0.837 with the internal consistency of excellent, good, good, excellent, and good respectively.

Table1: Coefficient of Cronbach's Alpha

S.N	Description	Cronbach's Alpha	Internal consistency
A.	**Manpower factor**	**0.844**	**Good**
1	Attitude	0.797	Acceptable
2	Age of labor	0.804	Good
3	Personal problems of labor	0.844	Good
4	Alcoholism	0.794	Acceptable
5	Absenteeism	0.813	Good
6	Labor Experience and skill	0.845	Good
B.	**Motivation factor**	**0.863**	**Good**
1	Timeliness of remuneration	0.861	Good
2	Reward/punishment	0.805	Good
3	Amount of Remuneration	0.829	Good
4	Training facilities/ session	0.827	Good
5	Recognition and Appreciation	0.846	Good
C.	**Resource factor**	**0.845**	**Good**
1	Increase in the price of material	0.791	Acceptable
2	Lack of construction material	0.839	Good
3	Unsuitability of materials storage location	0.816	Good
4	Lack of construction tools and equipment	0.826	Good
5	Poor access within the construction site	0.792	Acceptable
D.	**Project factor**	**0.848**	**Good**
1	Multiple sources of commanding	0.807	Good
2	Project location	0.828	Good
3	Project manager'sleadership	0.798	Acceptable
4	Lack of supervision	0.878	Good
5	Client intervention	0.812	Good
6	Structural Design-Complexity	0.799	Good
E.	**Miscellaneousfactor**	**0.920**	**Excellent**

1	Weather condition	0.924	Excellent
2	Working overtime	0.887	Good
3	Break time	0.889	Good
4	Social culture	0.914	Excellent
5	Economic condition	0.837	Good

FactorsAffecting Labor Productivity

Manpower Factor

As shown in Figure 1, the overall response from respondents regarding the manpower factor influencing labor productivity is presented. Labor experience and skill emerge as a primary factor, holding the top rank with a substantial RII value of 0.915. Following closely, Absenteeism secures the second position with an RII value of 0.877, while attitude claims the third rank with an RII value of 0.843. Additionally, alcoholism is identified as the fourth-ranking factor with an RII value of 0.807. Similarly, ranked fifth and sixth, the age of labor with RII 0.771 and personal problems of labor with RII 0.722 are significant. Insights from KII with construction experts affirm labor experience and skill's key role in road construction labor productivity.

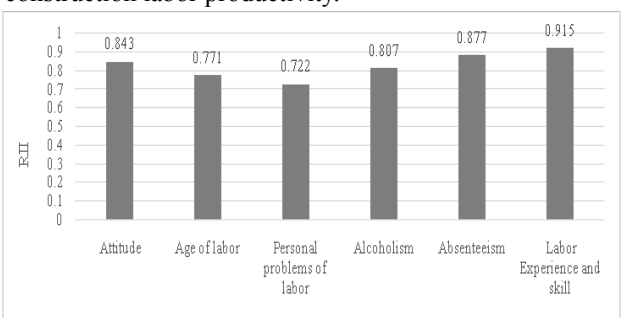

Figure 1: Manpower factor affecting labor productivity

Motivation Factor

In Figure 2, the collective response of respondents regarding motivation factors influencing labor productivity in road construction is depicted. Notably, the amount of remuneration secures the top rank with a significant RII value of 0.838. Following closely, the timeliness of remuneration claims the second position with an RII value of 0.824, while reward/punishment takes the third spot with an RII value of 0.802. The motivation factors ranked fourth and fifth, with RII values of 0.775 and 0.746, are training facilities/sessions and recognition and

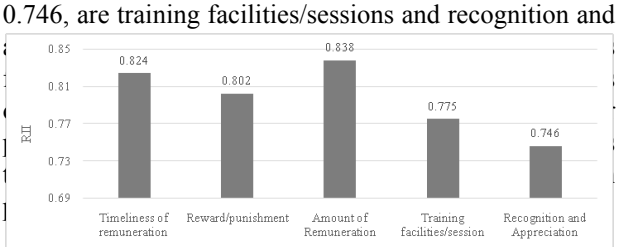

Figure 2: Motivation factor affecting labor productivity

Resource Factor

Figure 3 shows the overall result of total respondents regarding the resource factor affecting labor productivity in road construction projects. It reveals that Lack of construction material has been ranked as a major resource factor affecting labor productivity by the respondents with an RII value of 0.819. Lack of construction tools and equipment has been ranked as the second resource factor with an RII value of 0.802, Poor access within the construction site has been ranked as third with an RII value of 0.778. .The resource factors that have been ranked fourth and fifth with RII values of 0.751 and 0.730are an increase in the price of material and the unsuitability of materials storage location respectively. During the KII with experts in construction projects, it was found that Lack of construction material was the main resource factor affecting labor productivity in road construction projects.

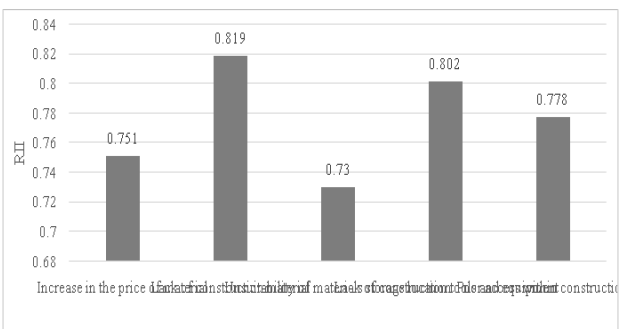

Figure 3: Resource factor affecting labor productivity

ProjectFactor

In Figure 4, the collective response from respondents regarding project factors impacting labor productivity is presented. Notably, lack of supervision claims the top rank as a major project factor with a substantial RII value

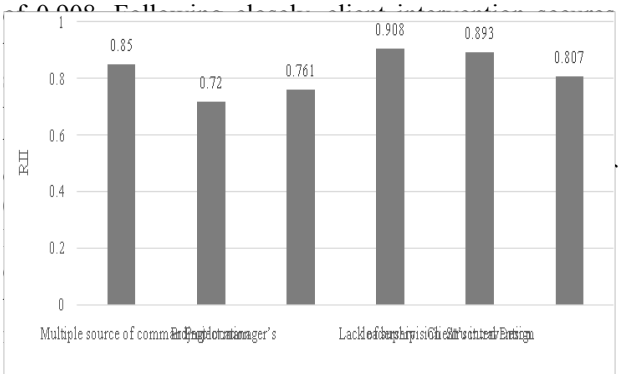

Figure 4: Project factor affecting labor productivity

Miscellaneous Factor

Figure 5 shows the overall result of total respondents regarding the miscellaneous factors affecting labor productivity in road construction projects. It reveals that weather conditionshave been ranked as a major miscellaneous factor affecting labor productivity by

the respondents with an RII value of 0.848. Economic condition has been ranked as the second resource factor with an RII value of 0.821, Break time has been ranked third with an RII value of 0.785.The miscellaneous factors that have been ranked fourth and fifth with RII values of 0.761 and 0.732are working overtime and social culture respectively. During the Key Information Interview (KII) with experts in construction projects, it was found that Weather condition was the main miscellaneous factor affecting labor productivity in road construction projects.

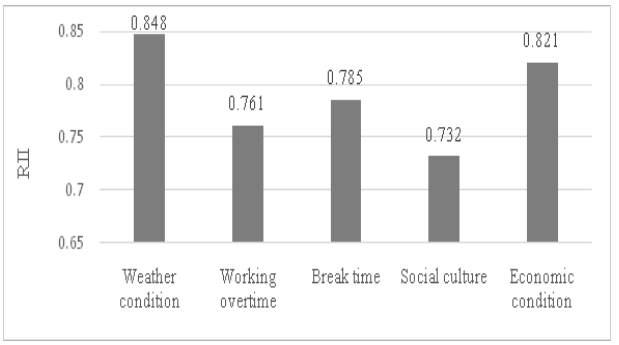

Figure 5: Miscellaneous factor affecting labor productivity

Labor productivity in construction projects is a global concern with factors impacting efficiency across diverse contexts. In projects with high density, the allocation of labor hours becomes crucial, and the emergence of resource limitations often necessitates the implementation of overtime work, impacting budgets and completion schedules (Bartoschek & Kirchev, 2021). Insights from Pakistan highlight unskilled workforce issues, payment delays, tool shortages, communication challenges, and financial constraints as factors affecting labor productivity (Alaloul et al., 2021). Similarly, research in the USA identifies a lack of labor supervision, experience, and skill, construction technology, design errors, and delays in responding to information requests as key productivity influencers (Almamlook et al., 2020). In India, research underscores the significance of skilled labor, material/ tool availability, project manager's leadership, site management communication, and safety conditions in shaping labor productivity (Ghate et al., 2016). These global findings emphasize the multifaceted nature of labor productivity challenges, urging tailored strategies for effective project management worldwide.

4. Conclusion

The primary aim of this research was to explore influencing factors for labor productivity in road construction projects, and potential improvements. Primary data were gathered through a questionnaire survey, field observations, and KII. The study unveiled the significant manpower factors affecting labor productivity as experience and skill, absenteeism, attitude, alcoholism, age of labor, and personal problems of labor. motivation factors influencing productivity were ranked as Amount of remuneration, timeliness of remuneration, reward/punishment, training facilities/sessions, and recognition and appreciation. resource factors were identified as lack of construction material, lack of construction tools and equipment, poor access within the construction site, increase in the price of material, and unsuitability of material storage location. Project factors affecting labor productivity included lack of supervision, client intervention, multiple sources of commanding, structural design complexity, project manager's leadership, and project location. Lastly, miscellaneous factors influencing labor productivity were weather conditions, economic conditions, break time, working overtime, and social culture. The study proposed several strategies for improving labor productivity, encompassing competitive and timely payment, proper resource allocation, efficient scheduling, availability of necessary tools and equipment, inventory management, standardized design processes, financial planning, and adequate break time, offering practical insights for enhancing road construction efficiency.

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Empirical Analysis of the Relationship between Participation Motivation, Service Attributes and Satisfaction of a Blockchain-Based Universal Loyalty Platform

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Abstract

This study examines the relationship between the characteristics of a blockchain-based universal loyalty platform and user engagement motivation and satisfaction. Traditional loyalty programmes are constrained by the complexity, length, and security vulnerabilities of the reward process. Blockchain technology, which can offset these limitations, possesses the characteristics of decentralisation, immutability, efficiency, and enhanced transparency and security. Transactions conducted using this technology are anticipated to bring security, trust, and cost savings to both business users and consumers. As blockchain technology has expanded in recent years, so has its application in loyalty programs. Blockchain-based loyalty programs are expected to differ from traditional loyalty programs in terms of factors that influence customer awareness, usage, and behavioural adoption decisions. Therefore, this study discusses the benefits and costs of universal loyalty platforms based on blockchain technology and explores how customers perceive blockchain-based loyalty platforms and the factors that influence their choice to use them using the self-determination theory and the integrated model of technology acceptance.

This study presents and characterises a universal loyalty platform utilising blockchain technology, discusses its characteristics, and proposes a research model for participation factors and satisfaction of universal loyalty platforms. A blockchain-based universal loyalty platform can overcome the limitations of traditional loyalty programmes, such as the complexity and longevity of obtaining and redeeming rewards, limited consumer rights, and security risks. The characteristics of blockchain technology, including cryptography (security), decentralisation, transparency, and smart contracts, contribute to enhanced security and efficiency for users. Furthermore, since the rewards earned by users are stored in a virtual wallet or account within the blockchain-based universal loyalty platform, they can be managed by the user and transferred and transacted between users according to the situation. From a business perspective, businesses can effectively participate in the platform network through smart contracts to attract new customers. Conversely, consumers can utilise their rewards in a wider range of regions and industries, thereby achieving scalability. From the customer perspective, the process of utilising rewards obtained from past consumption activities is not the sole objective. The acquisition and utilisation of rewards (tokens) on the universal loyalty platform should be perceived as an enjoyable and rewarding experience, which will encourage continued engagement.

In order to examine the impact of these characteristics of a blockchain-based universal loyalty platform on users' perceptions and behaviour, a research model based on self-determination theory and the integrated technology acceptance model was presented. It can be reasonably assumed that users will experience positive effects from the characteristics of a unified loyalty platform, including security, transparency, diversity, and efficiency. Nevertheless, as blockchain is still a rapidly developing non-standardised technology, there are limitations in compatibility and integration. Furthermore, the average individual is unlikely to be able to comprehend the intricate technology of blockchain, given the necessity of possessing a substantial degree of knowledge and time. These factors are anticipated to impede the utilisation of the universal loyalty platform, resulting in a decline in user satisfaction. This study offers an opportunity to expand and develop loyalty programme research by proposing a universal loyalty platform that combines the characteristics of loyalty programmes and blockchain, a major technology in the Fourth Industrial Revolution. This makes an academic contribution. In particular, it is possible to contrast traditional loyalty programmes with blockchain-based universal loyalty platforms and to analyse the effects of each. The attributes of the universal loyalty

Empirical Study on Learns, Earn and Certified Scheme in Higher Education System of Nepal: a Case Study of Top Schools Owned by Government and Private of Rupandehi Districts

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Abstract

Education system in Nepal is plagued by the traditional way of delivering the academic contains. However, some initiative has been enforced to change the few circumstances and automated the gap between the learning institution in cities and rural areas. Students with high temptation of learning are out of interest to learn here in Nepal which, is very shame status of higher education system we follow. These problems are further compounded in the public school system, where resources are scarce, accountability is weak, teaching is ineffective, and socio-economic conditions are not conducive to learning. Everyone is looking with priority that universites degree is been phased out or need to be change as per the new generation demand but, policy developer of Neplease education system are being diluated with influnce by political leaders. Similarly, major international initiatives such as Education for All and Millennium Development Goals have emphasized literacy and primary education and literacy leaving little resources for investment in higher education. However, in today's 'education age', secondary schooling is not enough to be competitive in the job market. Further, scholarships dry up even as higher education costs skyrocket. Most I/NGOs and corporations are focused on supporting students at the school level where many students can be supported with fewer resources. This case studies will add the value to know the reality to find the perception of 10+2 students after their graduation to endorse the information about the university and offer program similarly, to develop a mutual relationship with stakeholders and academician. However, it was realized that if learning modality of degree support students with stipend and activities based like three days studying in campus full time and remaining four days they work in relevant company or industry. This practice will initiate independency for student to study in Nepal and enjoy the learn, earn and, certification.

Keywords: *learning modality, earning possibilities, credit value crediential and certified with surveyed data and analysis*

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CONSTITUENTS OF DESIGN THINKING MINDSET

by

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Introduction and theoretical framework

- Many people consider themselves experts in Design Thinking; many others feel that they have always been and they just did not know the name.
- This happens because one of the most crucial elements in the Design Thinking approach is the Design Thinking mindset.

 (2)

- Design Thinking professionals consider measuring the impact of Design Thinking an imperative to understand the development of the most essential characteristic of a Design Thinker, which is if he "thinks" in the proper way.
- The Stanford University calls the mindset a set of "vital attitudes for the Design Thinker to hold".

 (3)

- The designer's mindset has been described to be composed of
  - Openness
  - Empathy
  - Intrinsic motivation
  - Mindfulness
  - Adjustment, and
  - Optimism.

- For some authors, the mindset describes the orientation towards the work at hand and the mentality on which problems are approached and it is described by the elements like:
  - being experimental and explorative
  - being ambiguity tolerant
  - being optimistic, and
  - being future-oriented.

- Some have identified 11 Design Thinking Mindsets:
  - Empathetic towards people's needs and context
  - Collaboratively geared and embracing diversity
  - Inquisitive and open to new perspectives and learning
  - Mindful of process and thinking modes
  - Experiential intelligence
  - Taking action deliberately

- Consciously creative
- Accepting uncertainty and open to risk
- Modelling behaviour
- Desire and determination to make a difference
- Critically questioning.

- Other authors have written about the characteristics of the mindset and it is possible to identify some common constructs like:
  - being focused on the user, being empathetic,
  - collaborative and open to diversity,
  - being comfortable with ambiguity,
  - embracing risk and experimentation, mindfulness and optimism.

- Some authors have included in the description of the mindset the tools like prototyping, visualization, iteration and testing.
- Many very different practices are labelled design thinking - making them challenging to analyse. So, there is the risk to measure something that is not Design Thinking.

  So far, the most valid measurement tools are feedbacks and customer satisfaction.

- Mindset is the set of attitudes, opinions, beliefs and behaviors that characterize an individual, a group, or an organization, mostly developed by experience.

- Dosi et al. (2018) ended up with a more precise categorization where the resulting constructs are interpreted in a wider way.

They identified *19 constructs*:

Design Thinking mindset constructs

Tolerance for - Resilience of - Being comfortable with Ambiguity – Uncertainty.

Being comfortable with ambiguity means being used to leave doors open as long as possible, to consider a solution as an imprecise concept and often inconclusive, to take part in a process in which the outcome, the volume of iterations and the time needed to reach the outcome are unknown.

Embracing Risk.

Embracing risk includes risking failure and failing fast and the inclination to take risks in terms of process (energy, time, ...) that allow a deep exploration of the context and of new solutions, however crazy/foolish/mad and unconventional.

In fact, designers are aware of exploration and expansion of the design knowledge. They are not able to leave risk taking out of consideration/ cannot ignore the risk taking.

It is a necessary condition for the design and innovation, and for receiving a subsequent reward.

Human centeredness.

Human centeredness means focusing on understanding human behaviors, needs, and values, a way to solve complex and strategic problems.

 (13)

Being user-centric does not mean asking customers what they want; rather, it is about finding out what they need. If one wants to be truly human centered, customer co-creation is not an option, it should be a key requirement.

Empathy.

Empathy is the foundation of a human-centered design process. It is the ability to see things from multiple perspectives, to create customer intimacy, is the ability to see and experience through another person's eyes, and to recognize why people do what they do.

 (14)

Being empathetic includes being open, avoiding being judgmental and being comfortable with people with different backgrounds and opinions.

Mindfulness and Awareness of Process.

Design Thinkers are aware of the process in the sense that they know where they are in the design process, whether they are involved in a converging or diverging phase,

if they have to be highly generative versus when it is necessary to converge on a single solution path.

 (15)

Holistic view/consider the problem as a whole.

This is the ability to consider the whole problem, taking into account many factors like socioeconomic patterns, relationships, dependencies,

including customer needs, technical feasibility, organizational constraints, regulatory implications, competitive forces, resource availability,

Strategic Implications as well as the Costs and Benefits of Different Solutions/Proposals, thus achieving a 360 degree view of the problem.

Problem reframing.

Problem reframing means reformulating the initial problem in a meaningful and holistic way,

widen, challenge the problem, taking all the findings and discovering a right interpretation.

Team working.

Design Thinkers need to collaborate, share their knowledge, discuss using visualization tools in order to better communicate and clarify what they have in mind.

It is considered a pre-condition of the implementation of Design Thinking; Affinity for Teamwork; designers routinely work closely with other designers and experts from other fields.

Team working is about sharing and jointly developing knowledge, and supporting other team members,

and for some authors is fundamental as designing is not something done exclusively inside one's head, but is often accomplished in interaction with other people, using expressions such as collaborative integrative thinking.

Multi- / inter- / cross- disciplinary collaboration.

Collaboration is essential to design thinking

and each Design Thinker needs to collaborate in a multidisciplinary team with other people with different backgrounds, perceptions and perspectives, or collaborating with people from other organizations.

Stanford School calls it "radical collaboration": bring together innovators with varied backgrounds and viewpoints.

 (19)

Enable breakthrough insights and solutions to emerge from the diversity.

Open to different perspectives/diversity.

Diversity can be understood as encompassing collaboration in diverse teams, and the integration of diverse outside perspectives throughout the process,

not always the term refers to skills but also to hierarchy.

 (20)

Diversity of perspectives, talents and experiences and expertise that encourage collaboration beyond the usual disciplines to tap into knowledge and experiences.

It is a philosophy of looking across the border so to look into other industries, how do they solve things that are similar

and then expand your own horizons to other organizations, but also to universities or design companies.

 (21)

Learning oriented.

Learning orientation is a key feature of Design Thinkers. Design thinkers have

an appetite for learning,

a desire to learn, including learning about others, challenging existing frameworks and seeking new contexts in which to learn something.

Their main source of learning is action: learning by doing through observations, rapid prototyping, and hypothesis formulation.

Experimentation or learn from mistakes or from failures.

Design Thinkers are confident in experimenting with failures because, due to their ambiguity, the failure is seen as a way to discover new opportunities, a way to learn.

Failing is not seen as a waste of time, but it is even encouraged: fail often and fail soon.

Experimentation is a bias towards testing and trying things out in an iterative way, and moving between divergent and convergent ways of thinking.

Experiential intelligence / Bias toward action.

Design Thinkers are characterized by the Experiential Intelligence: the ability to make tangible what's not,

to bring them to life,

to understand and activate all five human senses to make innovation tangible, known, and vibrant,

to transform the concepts generated in the What if stage into feasible, testable models,

to prefer action-oriented behavior over discussion and conceptual or analytical behavior.

Critical Questioning ("beginner's mind's", curiosity).

It is the exercise of questioning everything, is the ability of asking the right question,

to keep an open-mind about possibilities, to have a beginner mind, that is going to the origin of the problem by avoiding losing sight of what [the team] is working towards.

 (25)

Abductive thinking.

It is the logic of what might be, it means moving from what is ‘‘known’’ to the exploration of alternative solutions, is the generation of new ideas.

It is the ability of being future oriented, of building conclusions from incomplete information, making small leaps into a partially known future.

 (26)

Envisioning new things.

It is the ability to make ideas tangible, to envision possibilities, thanks to the use of drawings, mock-ups and bring them to life.

It includes the ability to 'see' the end result as a concrete and complete picture: to 'see' the complete solution played out in its most robust form,

to 'see' the way the business will work with all of the necessary partners and enterprise systems and even to 'see' success in the market and the potential paradigm shift that a breakthrough can trigger.

 (27)

Creative confidence.

Creativity is a mental activity, but it can also be part of a systems model.

It is the ability to think differently, to challenge traditional processes and styles.

Creativity is critical to Design Thinking as a mode to explore and express less tangible and more subjective content by making the abstract or non-experienced come to life.

The creative confidence is manifested when a person's trust in tackling problems of which you rather know what you don't know than what you actually know and it refers to one's own trust in his creative problem-solving abilities.

Desire to make a difference.

Design Thinking professionals have the desire and therefore are determined to have an impact, to make a difference, for example by creating something visual that breaks through, or are inclined to turn a discussion into a strategic intent.

They have a desire to develop the skills, structures and processes to generate value from valuable insights and they are determined to persuade someone of their idea and justify it if they think it is valuable.

Optimism to have an impact.

Optimism is a state of mind of Design Thinking teams.

Thus is ability to move forward, knowing they will not always be right but optimistic about their ability to experiment and conduct midcourse correction further down the road.

Revalidation of the Measure

An instrument was developed to assess the Design Thinking Mindset by following the standard procedure.

The instrument was administered on 105 academic and non-academic staff of an institution of higher learning in India.

The 37 statements of the instrument were subjected to factors analysis which condensed them into the following factors:

- *Factor 1: Optimism*
- *Factor 2: Rationality*
- *Factor 3: Empathy*
- *Factor 4: Orientation to Change*
- *Factor 5: Risk Taking*

- *Factor 6: Collaborative Approach*
- *Factor 7: Flexibility*
- *Factor 8: Novelty*
- *Factor 9: Team Orientation*
- *Factor 10: Openness*

The 10 factors were subjected to second order factor analysis, which reduced them into the following dimensions:

- *Dimension 1: Human Centredness*
- *Dimension 2: Learning Orientation*
- *Dimension 3: Rationality*
- *Dimension 4: Experimentation*
- *Dimension 5:Team Orientation*

- There is plenty of scope to work further in this area to understand the Design Thinking Mindset with more clarity and precision.

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Thanks