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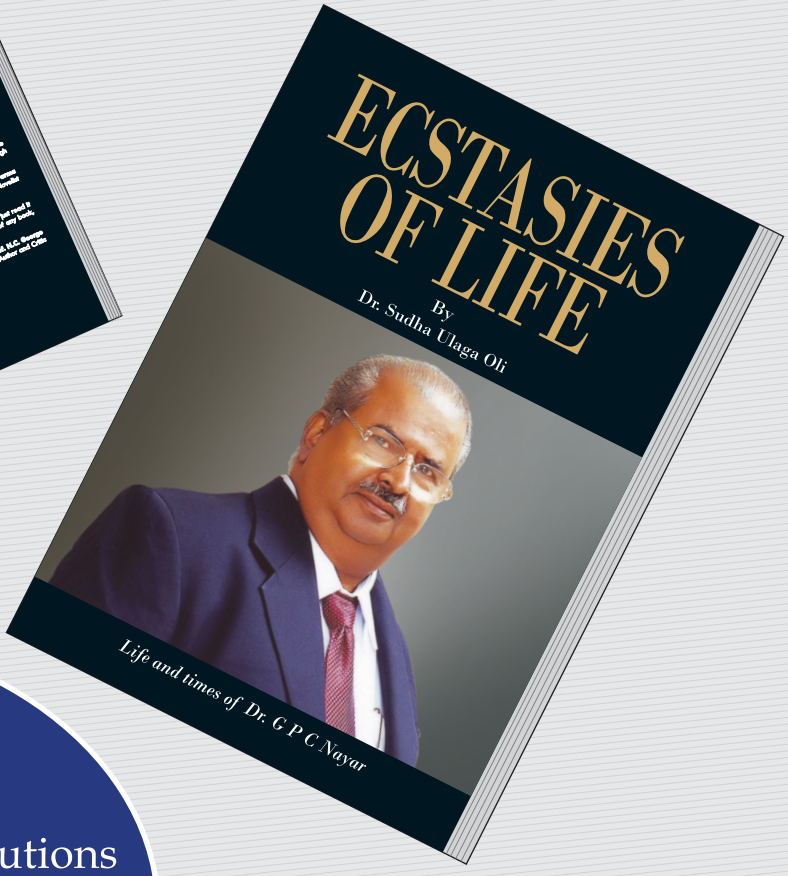

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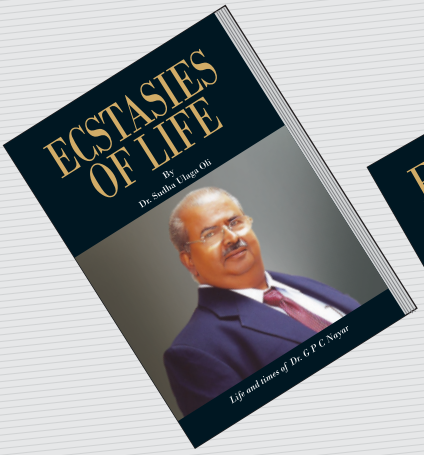

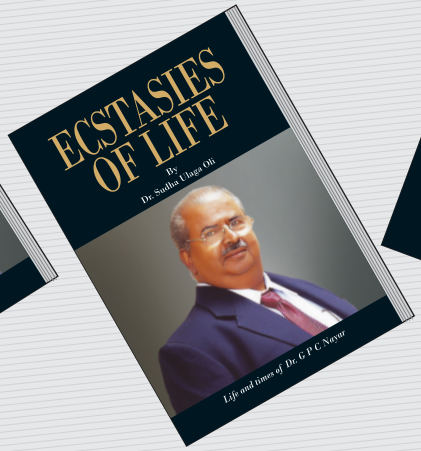

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Chairman's Overview

Every year's end is a time of reckoning- of good times and bad, of victories and failures, of joy and sorrow, of gains and losses. The year 2022 was a mixed bag- the world came through the third wave of Covid, and the economy showed some signs of recovery. However, this was offset by the war situation in Ukraine, rising inflation, and fears of a global recession. 2023 has dawned with much of the same concerns- the sudden lifting of China's pandemic restrictions leading to the latest Covid surge in China, the ongoing Russian- Ukraine war, and the IMF confirming that we are indeed headed for a global recession. The world economy is expected to grow at less than 2% in 2023, fulfilling the official definition of a global recession. The US, China and the EU are the most likely to be affected by the slowdown.

However, the prognosis for India appears more favourable. The Indian economy is expected to grow at around 6%, making it the world's fastest-growing large economy and giving some cause for cheer. Inflation remains a concern as the RBI continues to tighten interest rates. The Indian markets seem to have managed a successful decoupling to some extent by staying reasonably stable despite global shocks. The rupee is gradually strengthening against the dollar, and the crypto markets are entering an era of much-needed regulations and stabilisation after the meltdown of 2022. The domestic and international travel and tourism sectors have recovered well, helped by the 'revenge tourism' trend. It is reasonable to hope the country can pull through a challenging global economic situation and emerge with more robust fundamentals.

With that note, let me wish our patrons a very happy and prosperous New Year. May the experiences of the past be a learning experience from where we emerge stronger.

Wishing our readers a genuinely enriching reading experience.

Dr. G. P. C. NAYAR
Chairman, SCMS Group of Educational Institutions.

SCMS Journal of Indian Management

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SCMS-COCHIN

Editors

Editorial Board

Editorial

2022 has been a year of positive growth for the SCMS Journal of Indian Management. We published 39 articles covering a broad range of management disciplines, all after a rigorous process of peer review and editorial proofing. Currently, the average time taken for an accepted article from the date of submission to the date of publication is 9-12 months. We are also proud to report a growing interest from international authors in publishing with us, which indicates the increasing stature of the Journal in international academic circles.

The Journal has recorded a doubling in its Scopus Cite Score Tracker from 0.2 at the beginning of the year to 0.4 in the latest update (December 2022). This is a marked improvement from our 2021 Cite Score of 0.2 percent. As on date, the Journal also has a total of 4790 citations as captured by Google Scholar. Considering that these numbers are entirely organic and unmanipulated, it shows the relevance of what we publish to academia and industry. In 2023, we aim to scale greater heights and trust our loyal patrons will accompany us in our journey.

The last issue of the year carries an eclectic mix of thought-provoking contributions. The leading article examines the impact of uncontrollable working conditions in open-plan offices on creative outcomes. We also have a study investigating the influence of entrepreneurs' self-compassion (i.e., self-judgment, self-isolation, and mindfulness) on family-owned small business (F-OSB) performance during the pandemic.

This issue presents an innovative study that evaluates the efficiency impacts of the decision to demerger the Indian Railways using Data Envelope Analysis (DEA) and ranks the zonal railways based on the Malmquist Productivity Index (MPI). In addition, another team of authors presents a structured literature review on how to reduce the Ripple Effect in the supply chain by adopting analytics.

We have two studies that explore consumer behaviour in the retail environment. One study compares and contrasts store choice pre- and post-pandemic outbreaks. The other study aims to determine the relationship between Shopper Value, Customer Satisfaction and Customer Online Purchase Engagement (COPE) in the Indian online retail environment.

A few studies from scholars in finance and markets are also presented in the issue. The result of one of the studies reveals that there is a long-run causality between crude oil and cryptocurrency but not short-run causality. One of the contributions seeks to examine the significant impact of behavioural biases on the investment decision-making of individual investors in the presence of gender as a moderator. Finally, we have a study that uses the Delphi – AHP Integrated method to identify, prioritise and rank various barriers to digital financial inclusion in Public Sector Banks.

We thank our readers for your continued patronage and wish you an informative reading experience.

Dr. Radha Thevannoor

Creative Outcome of Employees in New Office Design: The Mediating Effect of Positive Work-Related Behavior

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Abstract

A work environment can have both positive and negative, direct and indirect effects on employee performance in terms of creative outcomes and productivity. Open floors are the most common design form, giving businesses more flexibility in space layouts and taking up less space for each employee, thereby reducing real estate costs. This paper examines the impact of uncontrollable working conditions in open-plan offices on creative outcomes. The study examines the mediating role of employees' work-related behaviour in relation to social interaction and well-being at work. The Partial Least Square Structural Equation Model (PLS-SEM) was used for data analysis in this study. The respondents were 117 office workers in a creative multimedia company in Iran (Tehran). This study showed that open-plan offices improve employees, social interaction, and overall employee communication by increasing their closeness and reflecting a more democratic work culture. Team members support and motivate each other by sharing knowledge and communicating with each other. In addition, positive work-related behaviours in the form of positive feelings, well-being, and sharing of information and ideas should develop and foster connections between employees, which can lead to the facilitation of creative outcomes. Creative and innovative companies are aware of this fact, which is why they seek to develop their work environments and, in particular, use open workspaces to foster their creative outcomes.

Keywords: *open-plan layouts, communication, creative outcome, positive work-related behaviour, well-being*

1. Introduction

People come to work with different expectations that can affect and vary the workplace. Office design and furnishings play an important role in the lives of employees. Therefore, a well-designed office space where employees can collaborate and be creative and productive is highly valued. The concept of open-plan offices was introduced years ago as part of the new forms of work. There are different names for this type of office design, such as collaborative workspaces or flexible, activity-based workspaces. Nowadays, open-plan offices are the new, cheaper way of office design, where only top management gets private office space. Open-plan offices require less square footage than traditional private offices and are more flexible. Evidence suggests that open workplaces allow for open and easy communication that allows workers to share information more quickly, easily, and informally. In effect, everyone sits at the same table, and workplace discussions can flow freely. In addition, open-plan offices are time-saving because employees can approach each other and ask questions instead of emailing or calling. On the other hand, open-plan offices, by creating distractions, prevent employees from focusing on their tasks and can cause them other problems as well (Abdullah & Alibaba, 2020; Ayoko & Ashkanasy, 2020; Brennan et al., 2002; Minutillo et al., 2020; Perrin Jegen & Chevret, 2016). However, the popularity of such insights has not stopped the tendency of employers to favour, support and use open-plan workplaces.

In open design, all employees from different teams work together in one large, common area. One of the main reasons for creating open-plan offices is to improve internal communication and encourage creative thinking in the workplace. After all, when multiple employees are housed in the same space, their interaction is easier. This fact benefits both the employees on the same team and the interaction between teams. It has been found that employees who sit within 30 meters of each other share significantly more knowledge than employees who are farther away. In fact, proximity and more communication in the workplace can build friendships between employees and promote their overall well-being at work. On the other hand, some employees come with uncontrollable working conditions, such as the lack of privacy for private conversations, and need more control over their territory or workplace with this type of office design. In this sense, previous studies have shown that allowing employees to choose their own physical environment leads to better employee outcomes, better mood, and better social relationships (Brennan et al., 2002; Budiharso & Tarman, 2020; Galasiu & Veitch, 2006; Huang et al., 2004; Paciuk, 1990; Parker et al., 2013; Samani & Alavi, 2020; Samani et al., 2018; Vega et al., 2020; Veitch & Gifford, 1996). Previous studies propose that environmental control is needed to enhance social interaction and well-being (Brennan et al., 2002; Colenberg et al., 2021; Dmitrenko et al., 2020; Huang et al., 2004; Kim & de Dear, 2013).

Open workplaces reduce environmental boundaries, leading to more team and group work among residents and better use of space. In this regard, some studies recommend that open-plan offices facilitate collaboration among employees who are in close proximity to each other (which is considered an advantage of this type of workplace design) (Brennan et al., 2002; Kim & de Dear, 2013; Lee & Guerin, 2009; Lee & Brand, 2005; Navai & Veitch, 2003; Samani & Alavi, 2020; Veitch et al., 2007). In contrast, other studies proposed that open-plan workstations do not facilitate collaboration, communication, and social contact group works among employees (Birnholtz et al., 2007; Brennan et al., 2002; Jo & Jeon, 2022; Kim & de Dear, 2013; Passero & Zannin, 2012). As previously mentioned, there are many issues associated with open office design, such as excessive noise, lack of privacy, the presence of others, increased workload, social issues, and distraction from myriad environmental conditions (Ayoko & Ashkanasy, 2020; Baldry & Barnes, 2012; Banbury & Berry, 2005; Duval et al., 2002; Jahncke et al., 2011; Jeon et al., 2022; Rashid et al., 2009; Roelofsen, 2008; Vega et al., 2020). In addition, these distractions often lead to negatively affecting individuals' satisfaction (both environmental and job satisfaction) (Lee & Brand, 2005; O'Neill, 2008), enhanced physiological stress (Chen et al., 2020; Lee & Brand, 2010; Rasila & Rothe, 2012), and have a negative effect on individual's outcome (Baldry & Barnes, 2012; Carnevale, 1992; Chen et al., 2020; Davis et al., 2011; Elsbach & Pratt, 2007; Hua, 2007; Jeon et al., 2022; Lee & Brand, 2010).

The term "workplace" is an appropriate combination of place, equipment, and technology that can support and facilitate the nature of work and maintain employee work-related behaviours, satisfaction, productivity, and loyalty (Rice & Mitchell-Ketzes, 2003). It is also essential to say that many of the work environment problems and solutions for promoting creativity are very similar to those for promoting positive work-related behaviour. Evidence shows that positive work-related behaviour in the workplace not only promotes employee creativity but also promotes employee comfort, well-being, and safety. In this vein, Dul and Ceylan (2010) described that positive work-related

behaviour in terms of positive mood in the workspace could mediate or moderate the relationship between the work environment and creativity and the relationship between the health, safety and comfort of the work environment. Moreover, the aim of human factors and ergonomics in the work environment is to design a workplace for positive human work-related behaviour and overall outcomes (Park et al., 2021; Volery & Tarabashkina, 2021).

The psychological comfort proposed by the Environmental Comfort Theory links psychosocial characteristics to environmental design and workplace management. This connection occurs through the concepts of territoriality, privacy and control (Vischer, 2007). The sense of territory, both individual (e.g. office and workplace) and group territory (e.g. team and group), affecting the quality of conversations are the main and key elements of psychological well-being. As shown previously, humans declare their territory through the design and personalisation of space, which includes marking their territory and establishing their own social connection and ability to control their environment (Chen et al., 2020; Fischer et al., 2004; Lee et al., 2015; Morrison & Smollan, 2020). Therefore, in situations where individuals can control aspects of their work environment, this condition can positively affect their social interaction and lead to a more creative outcome.

Careful attention to the workplace design is a beneficial activity to promote employees' positive work-related behaviour and outcome. In this condition, employees feel valued by the management and organisation (El-Zeiny, 2012; Höppe & Martinac, 1998; Schilleci, 2022). Thus, the role of the work environment and its characteristics in influencing employees' positive work-related behaviours is noteworthy. In addition, satisfaction with the work environment plays an important role in positive work behaviour, well-being and employee performance. As previously mentioned, well-being and emotions (both positive and negative feelings) also play an important role in an individual's creative outcomes at work (Amabile et al., 2005; Fredrickson & Losada, 2005; Volery & Tarabashkina, 2021).

Consequently, the design and physical aspects of the workplace can promote or inhibit individual social interaction and overall creative outcomes. This study was conducted in the offices of Fakhr Tousehe Sanat (FTS) Group, a creative multimedia company in Tehran. The results of the study show that moving from a private office room to an open-plan office where employees sit around a table in the main hall (in groups of 4 to 6 people) has a significant impact on employees' creative work behaviour by improving communication and social contact. In addition, most of the offices in this study were landscaped.

2. Literature Review

2.1 Work Environment and Employees' Perception

The conditions and environment that employees encounter in office buildings affect their work-related behaviours (well-being, satisfaction, and social interaction) and overall outcomes (Knight & Haslam, 2010). In this regard, the work environment must be designed to motivate the people who work in it to behave better and achieve better results. Positive emotions and feelings help individuals cope with difficult and challenging conditions. The work itself and the work environment significantly impact individual well-being, which is well documented in the psychological literature and studies. Well-being and overall positive work-related behaviours play an important role in people's creativity (Amabile et al., 2005; Fredrickson, 2001). The feelings of the individual result from the relationship between their general mood and their well-being. Indeed, well-being plays a fundamental role in the creation of successful societies.

Emotions and well-being play an important role in fostering creativity in the workplace, as shown by empirical studies in the field of creativity (Amabile et al., 2005; Tang et al., 2021; Volery & Tarabashkina, 2021; Zhou & George, 2001). The importance of a subclass of positive emotions, which includes love, joy, happiness, and well-being, is mentioned in the broaden-and-build theory of positive emotions. Based on this theory, someone who is positive or happy has a better ability to be creative than someone unhappy or negative (Fredrickson, 2001). Therefore, it is possible to say that positive work-related behaviour in the workplace positively improves individual creative outcomes.

Due to the rapid growth of organisational development, problems related to the work environment can now be seen as endless challenges. In fact, problems related to workplaces are becoming more and more evident as work increasingly shifts from physical manufacturing to mental manufacturing (Gajdzik & Wolniak, 2022; Luck, 2003). In addition, the mental production of innovation is important to the success of organisations. It is enhanced by individuals' ability to design their physical environment to meet their personal and work needs. Thus, it can be assumed that the work environment and individual perceptions of the workplace are key factors in an individual's work-related behaviours and outcomes.

Some important and serious aspects must be considered to create an efficient and healthy workplace. The environment of the workplace has several levels of meaning and value. Although the workplace itself does not elicit actions or behaviours, it can generally facilitate or diminish preferred behaviours and influence the energy and time users spend completing their tasks. Previous studies have shown the link between office interior design and employee health and well-being (Çağatay et al., 2017; Carlopio, 1996; Colenberg et al., 2021; Jo & Jeon, 2022; Kristanto et al., 2016; Leather et al., 2003; Lee & Brand, 2005; Schilleci, 2022). However, the effects of the new office design in the form of open-plan offices on employees' creativity and positive work behaviour at the workplace are hardly considered. A workplace's overall design and its influence on users is a very important concept. However, this influence is not only related to how people feel but also to their work performance, engagement, and creation of new knowledge (human capital) within the organisation. Therefore, studying the environmental characteristics and design of the workplace and human response is an important and essential area that needs more attention.

2.2 The Role of Uncontrollable Work Environment to Affect Employees' Work-related Behaviour and Creative Outcome

Environmental psychology and environmental behavioural studies (EBS) are two areas that deal with humans and their environment. They generally study the interactions between people and their everyday and socio-physical environment (Bonnes & Bonaiuto, 2002; De Young, 2013; Gifford, 2007; Walsh et al., 2000). These everyday environments include the home, workplace, school, and other community settings where people spend their time. The main theme of current workplace development is to consider the physical and social characteristics of the environment as an applicable system for creating better working conditions for employees' work lives. The environmental conditions employees experience in office buildings play an important role in meeting the needs of employees and promoting their satisfaction, well-being and productivity at work. Studies of organisational behaviour have found that the physical environment of the workplace can affect employees' well-being, satisfaction, productivity, creativity, and motivation at work (Dul et al., 2011; Hameed & Amjad, 2009; Kupritz & Hillsman, 2011; Lee & Brand, 2005; McGuire & McLaren, 2009)

In office design, there are different types of design, traditional and modern, including open-plan offices. Workplace design can affect employees' perceptions of work, work-related behaviours, and overall outcomes (De Croon et al., 2005). Within a workplace, tasks, social relationships and interactions, and the physical environment are some of the most important factors influencing organisational performance and functioning. In addition, studying the physical environment, which indirectly indicates equality and facilitates interpersonal contacts and relationships, is possible in organisations that value creativity.

As indicated earlier, a large percentage of employees agreed with the fact that a suitable working environment characterised by less noise, appropriate temperature, etc., in the office building promotes and supports their positive work-related behaviour and overall creative outcome at work. Therefore, favourable working conditions can also positively influence their behaviour, well-being, and social interaction with the work environment. According to Miller (2005), the level of creativity in the workplace is higher when there is a positive social climate. Therefore, social climate and interaction play an important role in fostering individual and collective creative ideas and mindsets and overall creative outcomes. Several theorists have also suggested that communicating ideas and information should encourage creativity (e.g., Amabile, 1996; Woodman et al., 1993). Social contact, cooperation and communication in the workplace should promote the individual's potential, creativity and performance (Colenberg et al., 2021; Schilleci, 2022). One of the key factors in the adoption of open plan offices was to develop and promote teamwork and communication among employees, and along with these two, to promote creativity; therefore, this type of office design is very popular in the creative industry to promote creativity and overall innovation in the workplace.

Positive work-related behaviours in the workplace (in terms of social interaction among employees and well-being in this study) have the potential to stimulate change in the workplace. It can foster positive connections among employees, leading to breakthrough ideas and innovations and facilitating creative outcomes. Social interaction refers to the extent to which individuals communicate with each other, which should lead to a balance between stability and knowledge sharing and promote dynamism, creativity, and innovation. Employees need to socialise and have effective conversations in the workplace. In fact, effective conversation and communication among employees is an important component of successful organisations. Good communication skills in the workplace enable employees and the employer to work better and achieve higher and better results (creatively and productively). However, the

importance of good social interaction and communication in an organisation is often ignored or disregarded. This situation can cause serious damage to the company, e.g. reduced productivity, waste of company resources, conflicts in the workplace and hindering creativity and profit.

Exhibit 1 shows the relationship between uncontrollable work environment (lack of personal control, presence of others, lack of privacy, uncontrollable noise), social interaction and creativity in open-plan offices.

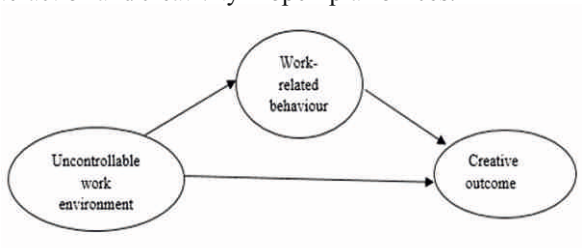

Figure 1. Relationship between uncontrollable work environment, work-related behaviour (in terms of well-being and social interaction and communication) and creative outcome in open-plan offices

In two well-known theories of creativity, namely the component model of creativity (Amabile et al., 1996) and the interactionist theory (Woodman et al., 1993), researchers assume that factors in the work environment, such as managerial support and social influences from group cohesion and interaction result are two notable conditions for fostering creativity. Perry-Smith and Shalley (2003) pointed out that theoretical and empirical studies in the field of creativity have addressed well-being and social relationships (in terms of interaction and communication) that affect creativity in general. However, little attention has been paid to the effects of interaction with different people on communication and overall creativity.

Indeed, people are more likely to commute if they feel they have control over their work environment and privacy, especially for confidential communications. Open-plan offices, on the one hand, reduce personal control and increase environmental distraction, which affects an individual's satisfaction with the environment and the overall outcome (Baldry & Barnes, 2012; Çağatay et al., 2017; Charles & Veitch, 2002; Hongisto et al., 2016; Hwang & Kim, 2013; Marquardt et al., 2002; Samani et al., 2017). On the other hand, there is increased positive work-related behaviour, such as positive cooperation, social interaction, and well-being of individuals. In fact, different types of work environments have different effects on employee well-being, relationships, and interaction (Brennan et al., 2002; Hua, 2007; Park et al., 2021; Rashid et al., 2009). Open-plan office design develops individual social relations that are necessary for creativity because of the low level of privacy and may enhance their creative outcome (Amabile & Pillemer, 2012; Brachos et al., 2007; Green, 2020; Samani et al., 2017; Volery & Tarabashkina, 2021). In the world of work, if both the individual and the environment meet and satisfy each other's needs, there will be a match. This means a positive relationship exists between the individual and the environment. Thus, if the environment meets and satisfies the needs of its inhabitants, they will feel more optimistic. Environmental psychology and psychological theories state that positive emotions, well-being, and satisfaction can improve people's appearance, results, and creativity in their work environment (Diener et al., 2020; Fredrickson, 2004; Harter et al., 2003; Vischer, 2007). However, the relationship between individual perceptions of the work environment and work-related behaviours and overall creative outcomes requires further investigation. Therefore, this study contributes to the investigation of this relationship. Thus, it is important to know how changes in office design affect individual work-related behaviour and overall creative outcome.

3. Materials and Methods

3.1 FTS Group

FTS Group, which was established in 2010, is located in Tehran. The company focuses on the production of commercials and short films. The company is located on the first and second floors of an office building and employs 124 people in addition to two secretaries, an HR and an office manager. The office includes five individual rooms and a hallway for the secretaries and the HR manager. Four rooms for the employees and one for the office manager. The employees were in groups of five in each room (except for one room with four employees). In each room, one person sat behind a single desk arranged around the room. In this seating position, the individual had visual privacy and less interaction with other employees.

Based on previous studies of the effects of open-plan offices on individuals' social relationships, communication, well-being, and creativity, the organisation and office manager of the FTS group wanted to know if the office environment and uncontrollable working conditions affected employees' work-related behaviours (especially social relationships, communication, and well-being) and creative outcomes.

3.2 Assessing Work Environment to Influence FTS Group

After the replacement of workplaces (conversion from private rooms to an open space layout), the workplace of the FTS faction was characterised by a completely open space layout (landscape). The open-plan workplace includes a hall, two private rooms for the office manager and HR, and a meeting room on each floor. Employees sat in a group of five in the main office hall around a single table. Compared to previous workplaces, employees have less individual control over aspects of the work environment (and their privacy and territory), which can also lead to environmental distractions. A cross-sectional survey was used to examine the impact of "the office environment in terms of open plan office to affect employees' actions (mainly social connection, communication and well-being) and creativity in this study. One hundred seventeen office staff from FTS Group participated in this study.

The survey included 23 items about the workplace and employees' perception of the working condition and five items about personal demographics. Contributors were asked to use a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) in responding. Various factors play a part in the mode of a distributed survey like perception about the uncontrollable working environment (lack of control, presence of others, lack of privacy, uncontrollable noise) (8 items), employees' work-related behaviour (social connection and communication (5 items), well-being (5 items)) and creative outcome (5 items) in open-plan offices. Survey items used in this study were also successfully measured in prior studies (Lee & Brand, 2005, 2010; MacMillan, 2012; Samani et al., 2017).

The survey questionnaire was manually distributed to 124 employees and two offices (except the HR and office manager) workers during working hours. Of the initial 124 responses, 117 surveys were found to be complete and trustworthy for data analysis, yielding a response rate of 91%. Of the participants, the majority were male (63%), and others were female (37%); 87% of employees were between 32 to 46 years old. In addition, the majority of participants had a master's degree (more than 50%), and about 47% of respondents had been with the FTS Group for more than four years.

4. Results

Structural equation modelling (SEM) was used to examine the hypothesised model of the study. The measurement model of the current study contained 23 measured items and 5 latent variables using a multi-item scale. The final results of "convergent validity" after all exclusions are shown in Table 2 (factor loading greater than 0.70 is acceptable). Although external loads between 0.40 and 0.70 should be considered for elimination; yet, elimination only makes sense if it results in an improvement in Composite Reliability or AVE. As indicated, the desired level of convergent validity for AVE is 0.50. In this context, two (out of eight) indicators of an uncontrollable work environment and two (out of ten) indicators of work-related behaviour were eliminated from the analysis. Thus, the nineteen elements in the conceptual model were retained for further analysis.

Table 1. Outer Loading

	Outer Loading		
	Uncontrollable Work Environment	**Creativity**	**Work-related Behaviour**
Uc 1	0.7094		
Uc 2	0.7612		
Uc 3	0.7325		
Uc 4	0.836		
Uc 5	0.837		
Uc 6	0.801		
Cr1		0.802	
Cr2		0.7153	
Cr3		0.8159	
Cr4		0.7572	
Cr5		0.7503	
Wo1			0.8004
Wo 2			0.835
Wo 3			0.8029
Wo 4			0.7794
Wo 5			0.7594
Wo6			0.773
Wo7			0.7438
Wo8			0.8011

The matrix's main diagonal of the AVE coefficient of each construct, standard deviations (Brennan et al. 2002), scale reliabilities (CR), and correlations that are used in this study are displayed in Table 2. Based on the results of the study, there is a significant correlation between the dependent and independent variables and limited collinearity between the independent ones.

Table 2. Means, standard deviations, reliabilities (CR), and correlations for reflective indicators

Variables	Mean	SD	AVE	CR	Discriminant Validity (Fornell-Larcker)		
					1	2	3
Uncontrollable work environment	4.37	6.758	0.569	0.856	**0.778**		
Creative outcome	4.51	6.110	0.690	0.894	0.452	**0.752**	
Work-related behaviour	5.06	5.409	0.533	0.896	0.497	0.636	**0.789**

Table 3. Direct Relationships

Hypothesis	Suggested Relationships	Path Coefficients	T-Value	Confidence Interval		P-Value	Support
				Low	Up		
H1- Uncontrollable Work Environment→Creative outcome	+	0.201	3.221	0.141	0.273	0.000	Yes
H2- Uncontrollable Work Environment→Work-related behaviour	+	0.387	6.241	0.312	0.471	0.000	Yes
H3- Work-related behaviour→Creative outcome	+	0.292	3.377	0.230	0.309	0.000	Yes

Note: The symbolises the arrows representing relationships.

Table 4. Mediator Analysis

Hypotheses	Indirect Effects	T-Value	Confidence Interval		Support
			Low	Up	
H4- uncontrollable work environment -> Work-related behaviour -> Creative outcome	β3 = 0.126	2.843	0.097	0.151	Yes

4.1 Hypotheses Testing

As shown in Table 3, the three relationships between the latent variables in the structural model reached statistical significance. The direct relationships for all hypotheses reached satisfactory levels (t-value more than 1.65, for significant levels of 10% (a = 0.10)).

In this study, the social interaction entity variables were hypothesised to mediate the relationship between uncontrollable work environment and creative outcome. To assess the mediating hypothesis, bootstrapping techniques (with 5000 resamples) and the full model PLS algorithm were used to obtain the path coefficient and its significant level (Wong, 2013). Hair et al. (2014) point out that the following formula estimates the path coefficient for indirect effects or mediators:

Path coefficient for indirect effects(β)= β XM*β MY

This finding supported the mediating effect of work-related behaviour in the context of an uncontrollable work environment and creative outcome (Table 4).

5. Results and Discussions

This study contributes to understanding the effects of uncontrollable work environments on employees' work-related behaviours and creative outcomes. The model tested shows that work-related behaviours have mediating effects and thus explains how an uncontrollable work environment (in terms of an open-plan office) can affect employees' creative outcomes. Overall, these results support and confirm the conclusions of Chen et al. (2020) and others that the physical and social aspects of the work environment influence employees' work-related behaviours as well as their well-being, environmental and job satisfaction, and overall outcomes, including creative and innovative outcomes, productivity, and performance. (Al-Anzi, 2009; Carlopio & Gardner, 1992; Colenberg et al., 2021; De Been & Beijer, 2014; Heerwagen, 1998; Jo & Jeon, 2022; McGuire & McLaren, 2009; Oldham & Rotchford, 1983; Schilleci, 2022; Shafaghat et al., 2014; Tetteh, 2012). In general, offices have the ability to provide and offer workers a sense of personal control, and the form and model of offices can also affect workers' positive work-related behaviours, as well as social relationships, health, well-being, and satisfaction (satisfaction with the workplace and environment). Open-plan offices are basically introduced to promote collaboration, well-being, and easy communication, which is essential for creativity.

Typically, open-plan offices are thought to facilitate collaboration and social contact by reducing physical distance and promoting teamwork and creative outcomes. In addition, the majority of employees indicated that the proximity of this type of office design made them feel socially active and connected to their colleagues. The result of descriptive statistical analysis in this research shows that 50% of Fakhr Tousehe Sanat (FTS) Group employees reported feeling comfortable in the new workplace (open-plan office design after relocation). More than 60% of employees reported having easy access to each other, and more than 45% said their current work environment was conducive to their creative output. The designers and programmers who work in open-plan offices at FTS, a creative multimedia company, therefore believe that their workplace improves their level of communication and social interaction, which can positively impact their creative outcomes. They, therefore, believe that more positive social interaction significantly affects their ability to be creative.

Indeed, people are more willing to commute when they feel they have control over their work environment and privacy, especially for confidential communications. Open-plan offices, on the one hand, reduce personal control and increase environmental distraction, which affects individuals' satisfaction with the environment and overall satisfaction. outcome (Baldry & Barnes, 2012; Çağatay et al., 2017; Charles & Veitch, 2002; Hongisto et al., 2016; Hwang & Kim, 2013; Marquardt et al., 2002; Parady et al., 2021; Rese, Görmar, & Herbig, 2021; Samani et al., 2017). On the other hand, there is increased positive work-related behaviour, such as positive cooperation, social interaction, and well-being of individuals. In fact, different types of work environments have different effects on employee well-being, relationships, and interaction (Brennan et al., 2002; Hua, 2007; Rashid et al., 2009). Based on the results of the recent workplace replacement study at Fakhr Tousehe Sanat (FTS) Group, more than 77.8% of employees reported positive communication and social interaction in their new workplace (an 8.5% improvement compared to their private office space). These results support the findings of a previous study explaining the impact of social climate and support on individuals' physical and emotional well-being in various settings (Parady et al., 2021; Repetti, 1987; Rese et al., 2021; Tymon & Stumpf, 2003). As can be seen from this study, open-plan offices have a positive effect on employees' work-related behaviours, as well as on the ease of communication, social relationships, and well-being necessary for individual and group creativity and creative outcomes. Based on the above discussion and evidence, many creative organisations are implementing open-plan offices to take advantage of these benefits.

The results of this study show that an uncontrollable work environment positively influences employees' work-related behaviours related to well-being and social interaction. Many employees in the FTS group (approximately 63%) reported feeling satisfied in the open work environment despite being unable to control some workplace factors. In fact, they reported that the current uncontrolled work environment had no negative impact on their work-related behaviour and overall creative output. In the work environment, correspondence occurs when both the individual and the environment meet and satisfy each other's needs. This means a positive relationship exists between the individual and the environment. Thus, if the environment meets and satisfies the needs of its inhabitants, they will feel more optimistic. Environmental psychology and psychological theories state that positive emotions,

well-being and satisfaction can improve people's appearance, results and creativity in their work environment (Diener et al., 2020; Fredrickson, 2004; Harter et al., 2003; Vischer, 2007).

Positive work-related behaviours (in terms of well-being, social interaction, and communication) in the work environment can positively impact individual and group creative outcomes in the creative economy. It can be concluded that easier and more open communication and social interaction between employees leads to more creative outcomes. Many employees in the FTS group indicated that they feel more creative in their new workplace (72%), which encourages them to interact more socially. According to Amabile's Component Theory (1997), the presence of some factors in the workplace can enhance and encourage overall employee creativity. Environmental characteristics also affect employees' positive feelings and social interactions. The component theory of creativity is a comprehensive model of the social and psychological components required for an individual to perform creative work. The theory is based on a definition of creativity as the production of ideas or outcomes that are both novel and suited to a specific goal. Therefore, more positive social interaction in the workplace increases the level of creative outcomes in creative industries. It can be concluded that a positive social climate and interaction play an important role in improving individual creative outcomes and overall innovation in the workplace. The design of open-plan offices promotes individual social relationships, which are necessary for creativity due to the low level of privacy, and can improve their creative outcomes (Amabile & Pillemer, 2012; Brachos et al., 2007; Green, 2020; Samani et al., 2017).

The result of this study (see above) is supported and explained by previous studies and theories. As previous research has shown, social events and relationships among workers in the work environment can be facilitated or constrained by some environmental characteristics such as the layout and size of spaces, flexibility, and proximity of the workplace (Budiharso & Tarman, 2020; Chen et al., 2020; Duval et al., 2002; Kim & de Dear, 2013; Minutillo et al., 2020; O'Neill, 2008; Vega et al., 2020; Veitch et al., 2007; Veitch et al., 2003). The fact is that people cannot walk through partitions or talk through walls, which means that private spaces and cells can limit their movement and collaboration (both physical and social). So, they confirmed that open-plan office design promotes social contact, collaboration, and communication in the workplace, which are critical to employees' collaboration, well-being, and satisfaction, as well as their overall creativity and creative outcomes. McLure Wasko and Faraj (2000) took environmental satisfaction and communication as two significant items for measuring social interaction and knowledge-sharing among co-workers in the work environment. Theorists in the field of creativity suggested that positive feeling, well-being and communication of information and ideas should develop and enhance creativity among individuals and groups at work (Amabile, 1996; Perry-Smith, 2006; Woodman et al., 1993; Zhu et al., 2022).

6. Conclusion

This study aimed to improve the understanding of how office design changes can be used to promote positive work-related behaviours and creative employee outcomes. In general, one of the central and significant issues in open-plan office design is the level of environmental problems and distractions. Architects often look for evidence of the relationship between the effects of environmental features on individual behaviour and outcomes (creativity and productivity) at work. The results of this study suggest that it is important to pay more attention to the physical factors and elements of the workplace to highlight their importance and promote positive work-related behaviours and creative outcomes among employees. Workplace design that promotes accessibility and visibility for employees has been shown to increase their positive work-related behaviours, well-being, collaboration, and overall performance. In addition, the results of this study will further enhance understanding of the role of individual perceptions of workplace environmental features and work-related behaviours, as well as overall creativity at work.

Overall, the results of the study at FTS Group state that redesigning the work environment to better meet employees' needs can improve their positive work-related behaviours and overall results. This insight can help managers see the value of designing the work environment and the importance of workplace equipment in motivating employees. Therefore, it is in every organisation's interest that their interior designers and managers pay close attention to the design of their workplace and how employees feel about it.

7. Limitations and Suggestions for Future Study

The purpose of this study was to better understand the relationships between uncontrollable work environments in the open work environment that affect employees' work-related behaviours and creative outcomes. In this regard, future researchers need to consider other environmental and personal elements that can also play an important role in enhancing creative outcomes. Based on the findings of this study, it is likely that positive work-related behaviours, such as social contact and communication, which can be achieved through workplace conditions, play an important role in enhancing individuals' creative outcomes. Consequently, further research would be valuable to show whether open-plan office design can improve positive social contacts and communication, enhancing work-related behaviours and creative outcomes. The focus of this study was on a private Iranian multimedia creative agency; future studies should also focus on other types of workplaces in other companies and countries.

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Demerger of Indian Railways: Efficiency Impact Evaluation

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Abstract

The rail sector of India went for demerger in 2003. After 17 years, it is high time to analyse the efficacy of that decision. This study evaluates the efficiency impacts of this decision using data envelope analysis (DEA) and ranks the zonal railways based on the Malmquist Productivity Index (MPI). Using the zone-level data for the period 2004-2017, this study traces efficiency gains for the passenger and freight business of Indian Railways. The inputs and outputs used in the study are selected such that no systemic bias due to specific operational characteristics pollutes the results. The findings of the paper bring out the pre and post demerger efficiency and productivity estimates. We found that demerger has an adverse impact on the efficiency and productivity of Indian railways, with new zones being less efficient than the older ones. The policy implications of this finding are important for rail organisations worldwide.

Keywords: *Railways, Demerger, Efficiency, DEA, Transport*

1. Introduction

Transport is the key input in the development process through its forward and backward linkages, but its effectiveness depends upon policy decisions related to transport infrastructure (Hilling et al., 2003). India is a fast urbanising economy (Ahluwalia, 2016), and transport constraints in the economy have been well acknowledged (Pucher et al., 2005). Rail transport is considered essential for sustainable development (Hayashi et al., 2011); hence, it is essential to study the efficiency of the rail sector. Contrary to the road infrastructure, the rail infrastructure has played a crucial role in augmenting economic growth in India (Pradhan & Bagchi, 2013). Indian Railway (IR), the world's fourth-largest rail network, has been India's principal mode of transport (Kulsreshtha & Nag, 2000). In 2003, a significant policy decision resulted in the demerger of the Indian Railways (Rama, 2002). After 2003, nine new railway zones were created from the erstwhile seven railway zones; thus, the rail sector of India got transformed into a total of 16 railway zones. Surprisingly, there are not many studies about the impact of this major decision to demerge the Indian rail sector on the basis of efficiency and productivity. Our study addresses this important question by analysing the before and after input-output matrix of all zones of Indian Railways because the demerger decisions are on the anvil of policymakers and such decisions are irreversible due to the socio-political environment (Indian Railway employs 1.3 million people). The lack of empirical evidence for the efficiency impact of earlier demerger decisions means future policy decisions will be taken in an information void. The use of Data Envelopment Analysis (DEA) methodology in performance benchmarking of the transport sector is a well-established practice (Cavaignac & Petiot, 2017) in the literature and the same has been applied in our study. The DEA-based Malmquist Productivity Index (MPI) approach to finding total factor productivity change is a proven method used for the transport sector (Agarwal et al., 2009).

This paper attempts efficiency benchmarking for all 16 zones of IR applying DEA and MPI over the most significant data set of 22 years with careful selection of input and output parameters. The analysis has been carried out in three parts. In the initial stage, the DEA is deployed on the pre and post demerger passenger and freight business, followed by the year-wise MPI analysis and, finally, the zone-wise MPI analysis. The deterioration in the dynamic efficiency after the demerger, particularly the casualty of the 2003 decision, is found to be the new zones, which seemingly got the inefficiencies transferred from old zones after the demerger.

The structure of the paper is as follows: Section 2 highlights the performance issues being faced by the rail sector in India. Section 3 covers the literature review. Section 4 describes the methodology, including data sources, model specification, and econometric methods. Section 5 discusses the findings, followed by the concluding remarks in Section 6.

2. Performance Scenario in the Rail Sector of India

IR is unique in the sense that it is the world's largest commercial employer (Pereira, 2014) and one of the oldest railways in the world that still remains untransformed, unlike most of the products of the colonial era, as those have become corporatised and unbundled in the last decade. The IR as an organisation being highly significant to the economy, and the deliberations of policies such as privatisation had gained huge focus even before literature on efficiency studies became popular (Dalvi, 1995). The declining financial performance of the organisation was recognised three decades back (Sriraman, 2000), and thus, it has been quite some time that the need for turnaround was felt (Mattoo, 2000; Raghuram, 2007; Gupta & Sathye, 2008). The key challenges before the rail sector in India were poor marketing strategy, capacity constraints, low staff productivity, departmentalism, and absence of autonomy (Raghuram & Gangwar, 2008). While the dire need for reforms in IR has been felt due to dwindling market share (Gangwar & Raghuram, 2017), the organisation has witnessed a severe decline in operating ratio (Business Today, 2019). Another challenge regarding the performance appraisal of the organisation is the long-pending reform of accrual accounting (Choudhary, 2019). It has been observed that the speed of trains is correlated with the socio-economic growth of a country (Ravi, 2019); hence, separate organisations like High Speed Corporations have been formed in the country. In addition, separate rail freight carriers like Dedicated Freight Corporation have been formed in the country. Hence, both the passenger and freight segments of IR will face tough challenges in future, which augments the importance of the study, as it is based upon the latest data.

3. Literature Review

The evolution of railways as a natural monopoly has been characterised by so much heterogeneity that most of the studies in this field have been country-specific, as in Table 1 below:

Table 1. Country-Specific Studies of Rail Sector Efficiency

Country/Region	Study
Iran	M. M. Movahedi et al. (2011), Rayeni and Saljooghi (2013)
Korea	H.-G. Kim et al. (2011)
Japan	Sekiguchi et al. (2010), Jitsuzumi & Nakamura (2010), Oum et al. (2013)
Brazil	Marchetti & Wanke (2017)
India	Deshpande & Weisskopf (2014), Ranjan et al. (2016)
Europe	Friebel et al.(2010), Cantos et al. (2012)
China	Qin et al. (2014), Song et al. (2016), Lanbing (2010)
US	Mallikarjun et al. (2014)

Note: Existing studies on railways countrywide.
Source: Author's own compilation

In our study, the focus is on analysing the rail sector of India; hence, we present a literature review of studies done on the Indian rail sector. The literature on this subject can be divided into two streams; one is concerned with the individual operational efficiency problems such as locomotive (Piu & Speranza, 2014) and timetabling (Dalapati et al., 2014) and ticketing (Gupta & Ahlawat, 2011). And the other is concerned with the measurement of dynamic efficiencies of different zones of the rail sector in India. Our paper belongs to the second stream of literature.

The study on the efficiency and productivity of the Indian rail sector has been highly popular amongst academics interested in the organisational efficiency and studies on the efficiency of the Indian rail sector in the era before the country's independence (Christensen, 1982; Bogart & Chaudhary, 2013). With the evolution of productivity frontier econometric methodologies, studies on the rail sector gained momentum worldwide (Oum et al., 1999). One of the oldest studies by Jha and Singh (1994) on the efficiency of the post-independence Indian rail sector made a valuable contribution. However, the study considered passenger-kilometre and tonne-kilometre as outputs that lack objectivity due to demographic heterogeneity and the widely varying weight-to-earnings ratio of rail cargo. A later study by Alivelu (2010) deployed a much-advanced methodology of the Tornquist index. However, this study also suffered from the objectivity of output variables due to the reasons stated above. Sharma et al. (2016) attempted ranking of the sixteen zones of Indian Railways based on the DEA findings, but with less robust inputs and outputs selected (authors selected output measures such as punctuality, number of accidents, and number of passenger complaints). The data of punctuality and customer complaints during the periods of this study have quality issues (not coming from data loggers but being fed manually) and are thus subject to manipulations (Sanyal et al., 2018), which can lead to spurious DEA results. Using customer complaints, it is observable that the output parameter is even more questionable owing to the absence of any objective customer complaint system in the freight operations (major revenue source) in Indian Railways. Similarly, yard derailments and goods train derailments are often not recorded as accidents in the official records, which invalidates the data of accidents considering that the 'safety' parameter for DEA is not suitable. Similarly, the selection of working expenses and track kilometres as input parameters is grossly problematic, as the former entails from non-accrual accounting system (where the boundary between revenue and capital expenditure is ambiguous) of Indian Railways, and the latter does not take into account the electrification and signalling aspects. Another similar study using the longitudinal data to measure cross efficiencies (Rangaraj & Abraham George, 2008) also suffered from shortcomings, as the number of passengers and wagons were used as parameters, wherein the former suffers from non-objectivity due to the economic-demographic profile of regions, and the latter has ambiguous ownership characteristic in the system. Another untenable assumption in this study was that locomotive holding of a zone is a measure of tractive effort for the zone. Locomotives held by one zonal railway haul up to even five different zones, and hence energy consumed in traction should be the input for DEA, which is not the case in the paper. Using a different methodology of DEMATEL-VIKOR, Ranjan et al. (2016) also attempted to rank 16 railway zones with regard to their performance but not bereft of the criteria validity problem. They also select route kilometres (different gauges, different traction and signalling systems make this study less robust), locomotive holding (zonal locomotives most often work

across zones, thus criterion invalid), passengers carried (heterogeneous demography problem), and the number of stations (not at all an decided on operational efficiency considerations). Hence, the input-output parameters selection for DEA application in the inter-zonal benchmarking of Indian Railways requires careful consideration of uncontestable internal validity.

Considering the suggestions of Mizutani and Usami (2016) for the Japanese Rail efficiency study, we have adopted energy and labour as input variables. Beck et al. (2012) stated that business earnings are the correct output variables for measuring rail sector efficiency; hence, we have considered passenger and freight earnings as output variables in our study. The bifurcation of earnings into passenger and freight components is drawn from Wanke et al. (2018), where the importance of separate efficiency measurements for passenger and freight is highlighted.

MPI as a measure to capture the dynamic efficiency of the rail sector has been used in studies on the rail sector (Nanbing, 2006; Li & Hu, 2010), the port sector in China (Fu et al., 2009; Ding et al., 2015), Korean rail (H. Kim & Lee, 2016) and British Railways (Cowie, 2018). In addition, the efficiency frontier analysis using MPI has found wide application in the literature that dealt with R&D (Thomas et al., 2009), healthcare services (Chowdhury et al., 2011), the performance of companies (Rastogi, 2011) and microfinance (Kabir Hassan et al., 2012; Sharma et al., 2020).

There are two gaps in the literature related to railways in India. First, considering the existing studies, it has been observed that the analysis of performance in the rail sector using labour and energy as inputs has not been taken into consideration. Moreover, there is no study on the impact of de-merger. Hence, this paper attempts to examine these literature gaps.

4. Data and Method

The study is done in two parts. The first part estimates the efficiency and productivity parameters using DEA and Malmquist Productivity Index (MPI), which is a non-parametric method. The second part applies the independent sample t–test, which is a parametric method. The software used for conducting DEA is DEAP 2.1, and STATA is used for carrying out independent sample t–test. An independent sample t-test is applied to examine the significance of the two independent zones of railways post-demerger.

4.1 Data and Sources

The data is taken for 16 railway zones in India that have been formed after the demerger. The data from 2004 to 2019 considered for the study is the resources from the Indian railways. The details of the zones are given in Annexure A1. The merger of the zones happened in 2003. Out of 16 zones, nine zones are older, and seven are new zones added to the Indian Railways. Since the zones of the Indian Railways are decision-making units (DMUs), we have selected Indian Railway zones as the unit of analysis.

4.2 Study Design

To find the impact of the demerger, all 16 demerged zones (details in Annexure 1) of Indian railways are taken for fifteen years (2004 to 2019). The efficiency is examined under the technical efficiency using both the constant returns to scale (CCR) and variables return to scale (VRS) model. Considering the monopoly of the market, the study has employed the output-oriented models. Out of 16 zones, nine are older, and the remaining seven are new. The t-test is applied to test the difference in the efficiency and productivity score of the old (nine) and new (seven) zones under both the constant returns to scale (CCR) and variables return to scale (VRS) models.

4.3 Efficiency and Productivity Measurement

The study selects fuel expense (both diesel and electric) and the number of employees as input parameters and passenger and freight earnings as output parameters (Table 2). These parameters are free from measurement errors, technical discrepancies and validity issues owing to the absence of the role of the state-owned operator in generating discretionary data. The selection of fuel costs and the number of staff reflects costs, and both are apt parameters, as transportation is the largest contributor (40%) of logistics costs in India (Chandra & Jain, 2009). Our inputs reflect the transactional cost, which has been found to be having a more important impact than the institutional factors on the efficiency of the rail sector (Merkert et al., 2010).

The input-output configuration for efficiency analysis is shown in Table 2.

Table 2. Description of model design

	Time Period	Number of Zones	Output	Input (all models)
Model	2003-04 to 2017-18	16	Passenger Earning (PE) Goods Earning (GE)	Staff strength (SS) and fuel expense (FE)

Note: Description of inputs and outputs for DEA model to evaluate efficiency.
Source: Author's own compilation

The methodology used in the current study is DEA and MPI. Technical Efficiency of the Decision-Making Units (DMU), i.e., the railway zones, are measured through DEA. To measure the technical efficiency, the input and output variables are to be known. The selected input parameters for the efficiency calculation are staff strength and fuel expense, and the output parameters are passenger earnings and goods earnings.

The DEA method measures the efficiency of one year. The efficiency change measured over the years is estimated through MPI. The Indian Railways has a natural monopoly (Li et al., 2018); hence, the concern is more toward increasing the output with input optimisation. Therefore, the paper used the output-oriented model to measure the efficiency scores.

4.3.1 Data Envelopment Analysis (DEA)

The DEA model was first developed by Farrell (1957) and was further developed by Charnes et al. (1978). The technique is a linear programming-based non-parametric approach, which estimates the DMU's relative performance. The method further identifies the scores ranging from 0 to 1, where 1 identifies efficient DMU. DEA works well over the techniques of multi-criteria decision-making units (Sarkis, 2000; Bouyssou, 1999; Velasquez & Hester, 2013), which is the reason behind the abundant use to examine rail sector efficiency.

DEA will ascertain the relative efficiency of a railway zone in India with a set of similar railway zones. An input-oriented efficiency measure explains how keeping the output constant, the inputs in the DMU can be minimised. An output-oriented model suggests that the outputs can be maximised by using the same level of inputs. The industries where the output can be extended ascertain the output-oriented efficiency.

$$\text{Efficiency} = \frac{Weighted\ sum\ of\ outputs}{Weighted\ sum\ of\ inputs} \quad (1)$$

$$\max_{\varphi,\lambda,s+,s-} \; zo = \varphi + \epsilon\,(eTs + + eTs-) \quad (2)$$
$$Subjet\ to \quad \Phi Yo - Y\lambda + s+ = 0$$
$$X\lambda + s- = Xo$$
$$\lambda, s+, s- \geq 0$$

Equation (1) explains the efficiency measure of a DMU, and equation (2) explains the output orientation of the model.

The different form of technical efficiency is run using the CCR model (Charnes et al., 1978) or the VRS or BCC model (Bankers et al., 1984). The CCR model assumes that the increase in input(s) augments the output(s) in proportion, whereas the VRS model assumes that an increase in the input(s) might increase or decrease the output(s). Both the models target pure technical and scale efficiencies.

4.3.2 Malmquist Productivity Index

The data used for the current study is related to the zonal data of the Indian railway for different years. Therefore, the study has used MPI considering the panel data to measure the efficiency change over the years, which is related to the measuring of productivity. MPI is split into technical efficiency change (EFFCH) (this is relative to the constant returns to scale), technological change (TECHCH), pure technical efficiency change (PECH) (this is relative to the variables returns to scale), scale efficiency (SECH), and total factor productivity (TFPCH)

Färe et al. (1994) explained the Malmquist Productivity Index (Output oriented) to find technical efficiency.

Total Factor Productivity (TFPCH) is the measure of technological change and efficiency (Schreyer, 2001), which is also known as a multi-factor productivity index that even measures the consecutive change in the periods. The total factor productivity is split into technical efficiency (EFFCH) and technological change (TECHCH). The TFPCH value, if more than one, denotes growth, whereas a value less than one indicates negative growth.

5. Results

The study results are divided into two parts: Efficiency estimates and the Malmquist index.

Table 3 explains the descriptive of the input and output of the Indian railways.

Table 3. Descriptive Statistics

	Passenger earning(O)	Goods earnings(O)	Fuel expense(I)	Staff strength(I)
Mean	20098333	45493864.73	11893647	80249.71094
STD	15271741	32239728.36	6657470	31905.63519
MIN	2377610	3006431	1765478	33373
MAX	73159583	158395539	32363223	164304
Count	256	256	256	256

Note: where, MAX= maximum; MIN= minimum; STD= standard deviation; I=input and O = output are taken for the study.

Table 4. Efficiency Estimates for CRS and VRS Model

S. No.	CRS	VRS
Z1	0.970	1
Z2	0.983	1
Z3	0.911	1
Z4	0.871	0.894
Z5	0.973	1
Z6	0.866	0.876
Z7	0.854	0.867
Z8	0.8	0.82
Z9	0.754	0.777
Z10	0.795	0.798
Z11	0.729	0.749
Z12	0.795	0.847
Z13	0.877	0.883
Z14	1	1
Z15	1	1
Z16	1	1
ME(All Zones)	0.886125	0.906938
ME(Z1-Z9)	0.887	0.915
ME(Z10_Z16)	0.885	0.897

Note: *The table shows the mean efficiency measured from DEAP 2.1.*
Where Zi and ME represent ith zone and mean efficiency, respectively.
Source: Author's own compilation

5.1 DEA Results

The mean technical efficiency of 16 zones for the CRS and VRS model under the output-oriented model is given in Table 4. The average efficiency of the 16 zones under the CRS model is 0.886, which means that an 11.4% increase in the output of all the zones will bring efficiency by maintaining the input level. Under the VRS model, the efficiency of all the zones can be reached by increasing the output by 9.4% through maintenance of the input level. The table also shows that the zones focusing on output maximisation to reach the efficiency level by maintaining the same amount of input, which is evident from the output of East Coast Railway –Z1 (27.1%) and North Frontier Railway-Z5 (2.7%), respectively.

Table 5. Malmquist Index Summary of Zones Means

S. NO.	Technical Efficiency Change (EFFCH)	Technological Efficiency Change (TECHCH)	Change in pure technical efficiency (PECH)	Change in scale efficiency (SECH)	Total factor productivity change (TFPCH)
Z1	1.002	1.002	1	1.002	1.004
Z2	0.999	0.989	1	0.999	0.987
Z3	0.995	0.988	0.989	1.006	0.983
Z4	1.002	0.98	1.001	1.001	0.982
Z5	0.998	0.979	0.997	1.002	0.977
Z6	0.994	0.98	0.993	1	0.974
Z7	1.008	0.971	1.007	1.001	0.98
Z8	1.008	0.961	1.007	1.001	0.968
Z9	1.019	0.96	1.017	1.002	0.978
Z10	1.015	0.97	1.015	1	0.985
Z11	1.008	0.972	1.008	1	0.98
Z12	1.015	1.003	1.011	1.004	1.018
Z13	1.009	0.969	1.008	1	0.977
Z14	0.999	0.976	0.999	1	0.974
Z15	1	0.988	1	1	0.988
Z16	1	1.001	1	1	1.001
Mean Efficiency	1.004	0.980	1.003	1.001	0.984

Note: The table shows the productivity estimates of the railway zones.

Source: Author's own compilation

Table 5 shows MPI estimates of all 16 zones along with the mean productivity scores. The average total factor productivity (TFPCH) shows an inefficiency in the productivity change as the mean MPI score is 0.984, which shows a 1.6% decline. The regressed growth is contributed by the technological efficiency change (TECHCH), where TFPCH = TECHCH* EFFCH. With respect to the mean score, Z1, Z12, and Z16 show progress and improvement in productivity. Z12 is the leading zone towing to the technical efficiency change (EFFCH). The Z12 shows a 1.1 % of pure technical efficiency and 0.4 % of scale efficiency. A DMU (Zones) with higher total factor productivity observes both higher technical efficiency and scale efficiency, which means an improvement in total factor productivity needs synchronous improvement of both scale and technical efficiency. Therefore, the overall impact of demerger on efficiency is negative.

Table 6. Independent Sample t-test results

SN	Orientation	Return of Scale	Productivity	t-statistics	p-value
Part A: Independent t – test results efficiency estimates					
1	Output	CRS	TE	-4.227	.0007
2	Output	VRS	TE	-40006	.0011
Part B: Independent t – test results productivity estimates					
1	Output	MPI –Index	EFFCH	-3.3935	.0040
2	Output	MPI –Index	TECHCH	-3.5798	.0027
3	Output	MPI –Index	PECH	-3.4057	.0039
4	Output	MPI –Index	SECH	-3.4035	.0039
5	Output	MPI –Index	TFCH	-3.5606	.0028
6	Input	MPI –Index	EFFCH	-3.3935	.0040
7	Input	MPI –Index	TECHCH	-3.5798	.0027
8	Input	MPI –Index	PECH	-3.4226	.0038
9	Input	MPI –Index	SECH	-3.3858	.0041
10	Input	MPI –Index	TFCH	-3.5606	.0028

Note: Change is significant for all productivity estimates at 5% significance level
Source: Author's own compilation

5.2 Independent t-test results

Tables 6 (A) and (B) present the independent t–test for technical efficiency estimates and productivity estimates, respectively. The results show that in the post demerger period, the technical efficiency estimates under both the CRS and VRS models are significantly different, and further depicts that the productivity scores, including TECHCH, PECH, SECH, TFCH, EFFCH are significantly different due to the demerger.

Upon comparing the mean CRS and VRS estimates of 9 old zones (0.887 & 0.915) with that of 7 new zones (0.885 & 0.897), we have found that old zones score better than new zones. Moreover, there was an overall loss of 1.6% total factor productivity owing to demerger (which is found significant), which indicates the presence of some inefficiency in the previous zones that got transferred to new zones. Thus, new zones need special efforts to have efficiency convergence. The technical efficiency considers the administration and management of various zones. Further, the improvement in those zones can be enmeshed with the change in both management and administration that, in turn, leads to the improvement in the scale of the production. The technology enlargement cannot simply improve the productivity of the various zones. Therefore, the results suggest that the demerger had a significant impact on the efficiency of the zones.

6. Concluding Remarks

This study contributes in three ways: First, it highlights the pitfalls of indicators like punctuality and customer complaints used in the DEA analysis of Indian Railway zones, as is evident in the existing literature. Second, the important missing link in the literature on the impact of the mega decision of demerger on railway zones has been addressed. Naveen (2002) conducted the only study on the demerging of railway zones, though it was bereft of any empirical work. Third, the study highlights the significant difference in the efficiency and productivity of the various zones. Zones requiring maximum improvement to reach efficiency are identified in this study. We also found a decline in total factor productivity at the organisation level for Indian Railways post demerger. This change is found significant, which indicates that the demerger was a path-changing event for Indian Railways.

The policy implications of our findings are immense, as this is the first study that provides empirical evidence regarding the efficiency and productivity that has taken a hit after the demerger decision on Indian Railways. The finding is important from a policy perspective, as Indian Railways is

planning further demerger of the zones. Researchers have been informed that a decision to create a new zone (South Coast Railway) has already been taken. Our findings have become even more important due to the fact that zonal railways in India are going to face tough competition from the opening up of the country's rail sector for private participation. Considering the scenario, parameters like efficiency and productivity have become crucial factors of survival in the market. There is scope for more research on additional units of analysis like the PSU rail sector (e.g. Konkan Railways), and suburban and metro rails.

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Environmental Enablers for Adoption of Analytics: Reduction in Ripple Effect Across the Supply Chain

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Abstract

Analytics adds value by reducing the impact of the ripple effect in the supply chain, which leads to improved performance. Although the use of analytics has started gaining the attention of many academicians and decision-makers, there is a dearth of its acceptance, especially in small-scale firms. There is a need to increase the discussion on analytics, especially in emerging economies, to increase its inclusion in small businesses. This research study with dual objectives is a novel attempt in this regard. Firstly, this work primarily focuses on determining the circumstances which enable the adoption of analytics in the supply chain. Specifically, the authors have thoroughly reviewed the role of environmental enablers. The most important and crucial environmental enablers for the adoption of analytics are projected using a detailed and structured literature review. Secondly, the impact of the implementation of analytics on the performance of the supply chain is also evaluated. This research work is intended to add to the existing knowledge base that should help gain a better understanding of the topic. The revelations from the integrated approach provide useful guidelines for the practitioners operating in the area of supply chains.

Keywords*: Environmental enablers; Supply chain performance; Analytics in the supply chain; Ripple effect*

1. Introduction

Today, it is quite an accepted and well-established phenomenon that the competition is no more between the firms as used to be the case probably a decade earlier. These days supply chains are facing the brunt (Manteghi et al., 2020; Sood & Jain, 2020). To increase organisational performance and gain a competitive advantage, the entire supply chain management has to be effective as well as efficient (Trkman et al., 2010; Dubey et al., 2021). The performance of the supply chains should be increased such that the increase in the supply chain performance should also reflect in the performance of each firm comprising the chains (Tai et al., 2020; Ogbuke et al., 2022). Interestingly, the Ripple effect is considered a crucial performance indicator or measure for assessing and adjudging supply chain performance. When the Ripple effect is reduced, the firms can retort to the uncertainties of the external environment, including market conditions and consumer expectations (Hosseini & Ivanov, 2019). Therefore, reducing the ripple effect may be one way of improvising the performance of the supply chains (Lee & Mangalaraj, 2022). The Ripple effect can be understood as the proliferation of the adverse influence and bearing of unprecedented events in the supply chain from the starting point of that event (Pavlov et al., 2019; Özçelik et al., 2020).

Further, the availability and utilisation of apposite information, optimum management of the materials, and proper planning and execution lead to a reduction of overall cost, which aids supply chain effectiveness (Choi et al., 2019; Grimm et al., 2022). However, maintenance, monitoring and improvement of the performance for an effective and efficient supply chain is challenging owing to its inherent complexities (Ahmed et al., 2022). In the context of contemporary supply chains, it is anticipated that the use of interconnected information systems (Golan et al., 2020) helps in the smooth flow of data across the chain and enables the firms to reduce the Ripple effect. In addition, the dynamism of the existing global business environment requires the supply chains to become smarter in order to tackle the uncertainties of fast-evolving businesses.

A well-collaborated, integrated and technologically advanced supply chain is known as a smart supply chain (Gunasekaran et al., 2017). Smart supply chains can address the threats in businesses by utilising the available information. The data is investigated using analytics which facilitates focused decision-making (Marthandan & Tang, 2010; Wu et al., 2016). The importance of analytics in the supply chain can be justified by the fact that a huge and enormous bundle of both internal and external data is being generated regularly throughout various processes across the different levels (upstream to downstream) of the supply chain (Mashingaidze & Backhouse, 2017; Kache & Seuring, 2017). If not used judiciously, the potential knowledge and information hidden in the data also go to waste and become an opportunity loss for the firms.

Analytics creates value by utilising the available data for the firms in many ways. Analytics is used for analysing and generating meaning from data, enabling the firms to make a decision and perform proactively, eventually leading to their overall improvement. Analytical decision-making is believed to increase the efficiency of the firms individually and the supply chain collectively (Banerjee et al., 2013; Nguyen et al., 2018). For instance, analytics facilitates accurate forecasting leading to robust decision-making related to inventory management, supplier management, logistics and overall customer satisfaction. Furthermore, analytics continuously ensures improved supply chain management because it is an ongoing process and not a one-time exercise (Trkman et al., 2010; Ogbuke et al., 2022).

Possession and use of analytics come under the Resource-Based view (RBV) perspective. Barney, in 1991, proposed RBV in his seminal work and discussed the importance of a) resources possessed by the firms and b) the utilisation of these resources, termed resource orchestration (Sirmon et al., 2011; Hitt et al., 2016). This resource optimisation can ultimately affect the firms' performance. Analytics is indeed one kind of VRIN (valuable, rare, irreplaceable and non-imitable) resource. Due to its potential to affect the performance of the firms and the supply chain as a whole, every firm is in pursuit of utilising it (Gunasekaran et al., 2018; Seyedan & Mafakheri, 2020). Analytics is an emerging field that has been quickly adopted across quite a few industries and sectors. Some industries and big corporate houses have already started making use of this and have become reliant on data and analytics to run their businesses (Maheshwari et al., 2020; Sangeetha et al., 2022).

There has been an increase in the speculations surrounding the use of analytics. Hence, researchers and practitioners are taking a keen interest in studying the effects of adopting advanced analytics on supply chain performance (Ahmed et al., 2022). The financial sector, retail and medicine are among the top users of analytics; although analytics has found a great deal of acceptance even in the manufacturing sector, this dissemination is mostly limited to developed countries (Marchese & Dollar, 2015; Srinivasan & Swink, 2018). In the context of the developed world, it is evident

that the adoption of analytics benefits firms by making their systems more robust. However, owing to the cost and resources involved in the adoption of analytics, its applicability for the firms operating in emerging markets is still at a nearly negligible or nascent stage. Moreover, several entities operating in developing countries have not enabled data-driven decision-making so far (Wamba et al., 2020).

The sanction of the surmise for the positive effect of analytics on the firms using it can be extended to the firms which have not yet adopted analytical capabilities in their business practices (Sood & Jain, 2020; Lee & Mangalaraj, 2022). Through this paper, an attempt has been made to provide authentic and relevant guidance for the practitioners and researchers working on the acceptance of analytical capabilities in the supply chain and studying the effects of the adoption of analytics on supply chain performance. The quest is ultimately to uncover the challenges imposed in making the supply chains smarter. There is substantial research done on the effects of the adoption of analytics on supply chain performance. However, to the best of our knowledge, none of the research has focused on understanding the impact of using analytics in reducing the Ripple effect. Moreover, there is a need for research work to find the enablers for the adoption of analytics, which is particularly important for firms operating in emerging markets.

An extensive literature review found that the enablers for the adoption of technology could be classified into four broad categories, viz. organisation, environment, technology and perception (Zhu et al., 2002; Racherla & Hu, 2008). This research work focuses specifically on understanding the role of environmental enablers, more so because extraction of value from data and analytics is hampered the most due to the micro and macro-level environmental barriers as mentioned in the McKinsey report of 2016, titled 'The age of analytics: Competing in a data-driven world' (Henke et al., 2016).

1.1. Objective

The adoption of analytics in supply chain management can be considered to be at the embryonic stage, and the related research work so far has not been as mature. The authors intend to perform a systematic and thorough review of the literature on environmental enablers for the adoption of various types of technologies to identify the enablers for the adoption of analytics. Further, the authors wish to decipher its impact on the Ripple effect in the supply chain. To the best of our knowledge, no attempt has been made to investigate these relations. Synthesis from a thorough literature review of related work led the authors to recapitulate the existing research findings on the related topic and propose organisational factors which influence, enable or inhibit the adoption of analytics by the firms comprising the supply chains.

The objective of the research work is particularly threefold, as mentioned below:

- A thorough study of the literature related to the environmental enablers for the adoption of various types of technologies.
- Proposing various environmental enablers for the adoption of analytics.
- Study on the impact of the adoption of analytics on the ripple effect in the supply chain.

The rest of the study is organised as the research methodology, literature review, propositions, conclusion, implications and limitations, as well as future scope.

2. Research Methodology

A thorough literature review is considered "an organised, explicit and reproducible way of identifying, assessing and interpreting the existing recorded literature" (Sood & Jain, 2020). A systematic and exhaustive review of the literature enables the emergence of explicit patterns and trends. The learnings from the review of the literature further add to the existing knowledge base and also assist in recognising gaps in the literature that need attention. Consequentially, working on these gaps may even lead to theory development (Wu et al., 2016; Lambert & Enz, 2017) other than expediting solutions for the prevailing issues for the benefit of the practitioners.

The below-mentioned two questions primarily guide this research work; the answers to these questions are intended to provide a foundation for the development of the concept.

1. Which environmental enablers have a role in the adoption of analytics?
2. What would be the impact of analytics on the Ripple effect in the supply chain?

The answers to these questions are explored using a protuberant research approach named content analysis. Content analysis has been used by several eminent researchers (Seuring & Müller, 2008; Marying, 2010; Nguyen et al., 2018). Content analysis is a robust and reliable technique for conducting a review of literature that

provides rigour. This methodology incorporates a few recurring procedures.

The selection of the literature begins with choosing a phenomenon for conducting the research work. Then a list of keywords is prepared for searching for the appropriate articles. Choosing the correct keywords is imperative for the identification of useful articles. Keywords should be quintessential and contemplate the objective of the research work to be carried out. The present research work aimed to discern the factors influencing the adoption of various technological platforms.

As mentioned, the selection of literature for conducting the present research work included the choice of appropriate keywords. The choice of keywords is very crucial because the keywords should be able to reflect the essence of the research objectives. Since the objective was to identify the enablers for various types of technologies, the articles were searched using the words like "determinants", "enablers", "drivers", and "factors" for technology adoption. All the research articles from the last thirty years were searched using combinations of the mentioned keywords (Sood & Jain, 2020). The reason for choosing this time frame was that it was the time when the industry experienced various evolutions such as business process re-engineering, e-commerce and business analytics, and these practices also embarked on the beginning of Industry 4.0.

The articles were prudently searched in the Scopus database of the abstracts and citations. Scopus is a renowned and prestigious database of peer-reviewed literature consisting of more than 50,000 journals. For refinement of the search, the subject areas were limited to decision sciences, social sciences, business management and computer science. An initial search based on the titles of the papers led to shortlisting of 175 research papers. The abstracts of the shortlisted papers were then studied to understand the objectives and contribution of the work. Finally, after scrutiny of the abstracts, the selection of the relevant articles was made. Finally, 116 research articles were used to conduct the present research work. The selected 116 articles included enablers for eleven types of technologies like knowledge management, ICT, technology, cloud computing, information technology, ERP, eMarketing, RFID, internet technology, eCommerce and EDI.

3. Literature Review

3.1. Enablers

The adoption of technology most likely happens when the firms are predisposed to anticipated technological development (Rahayu & Day, 2015). The more any firm is equipped for technological up-gradation, the more likely the adoption will happen. Technology adoption is part of the firm's innovation process and has become imperative for firms to survive and flourish in the dynamic and competitive business environment (Lee & Choi, 2003; Jhaveri & Sood, 2017). Therefore, firms need the ability to acquire and maintain technology. Extant literature posits that many environmental factors have an impact on the adoption of various technologies by firms. Table 1 contains an exhaustive list of all the thirteen environment-related factors identified from the literature on technology adoption. These enablers are Regulations, Trading Partners, Providers, Communication, Collaboration, Integration, SCM, Customers, Channel Power, Competition, External Environment, Industry and Relative Advantage. These enablers exhibit an influence on the adoption-related decision for various forms of technologies.

Table 1. Literature Review of Environmental Enablers of Technology Adoption

Authors	Type of Tech.	Enablers												
		Re	TP	Pr	Co	Col	Int	SCM	Cus	ChP	Glo	Com	Ind	RA
Del Aguila-Obra & Padilla-Meléndez (2006)	IT		Y	Y									Y	
Anantatmula & Kanungo (2010)	KM				Y	Y								
Love & Gunasekaran (1997)	Tech						Y							
Jharkharia & Shankar (2004)	IT		Y			Y	Y	Y						
Thakkar et al. (2008)	IT					Y			Y			Y		
Sarker & Lee (2003)	ERP				Y									

Authors	Type of Tech.	Enablers												
		Re	TP	Pr	Co	Col	Int	SCM	Cus	ChP	Glo	Com	Ind	RA
Beliveau et al. (2011)	KM						Y							
Bandyopadhyay & Sen (2011)	Tech				Y									
Ugwu et al. (2003)	IT	Y			Y		Y							
Kannabiran & Dharmalingam (2012)	IT											Y		
Karamat et al. (2018)	KM								Y					
Shah & Kant (2018)	KM	Y												
Goktas et al., 2013	ICT						Y							
Attaran (2007)	RFID			Y										
Hwang & Min (2015)	ERP		Y									Y		
Fawcett et al. (2007)	IT		Y			Y			Y	Y	Y	Y		
Bharati & Chaudhury (2006)	Tech								Y					
Troshani & Doolin (2005)	Tech	Y										Y	Y	Y
Luken & Van Rompaey (2008)	Tech	Y						Y			Y			
Nguyen et al. (2015)	Tech			Y		Y				Y				
Zhang & Dhaliwal (2009)	Tech		Y									Y		
Zhu & Kraemer (2005)	Tech	Y										Y		
Bossle et al. (2016)	Tech	Y						Y						
Sharma & Citurs (2005a)	RFID	Y						Y	Y	Y		Y	Y	
Oliveira & Martins (2009)	IT						Y					Y		
Zhu et al. (2002)	Tech		Y						Y			Y		
Nikas et al. (2007)	Tech		Y						Y			Y		
Ghobakhloo et al. (2011)	IT	Y		Y					Y			Y		
Alkhater et al. (2018)	Cloud Comp	Y											Y	Y
Gupta et al. (2013)	Cloud Comp					Y								
Avram (2014)	Cloud Comp										Y			
Phaphoom et al. (2015)	Cloud Comp			Y			Y							
Priyadarshinee et al. (2017)	Cloud Comp												Y	
Raut et al. (2017)	Cloud Comp	Y										Y		
Astri (2015)	Cloud Comp					Y								
Oliveira & Martins (2010)	IT											Y		
Calantone et al. (2006)	Tech	Y												
Triguero et al. (2013)	Tech	Y				Y		Y	Y					

Authors	Type of Tech.	Enablers												
		Re	TP	Pr	Co	Col	Int	SCM	Cus	ChP	Glo	Com	Ind	RA
Oliveira et al. (2014)	Cloud Comp	Y										Y		Y
El-Gazzar et al. (2016)	Cloud Comp		Y											
Ranganathan et al. (2004)	Web Tech							Y				Y		
Sharma & Citurs (2005b)	RFID	Y						Y		Y		Y	Y	
Lee et al. (2013)	Tech							Y	Y		Y			
Racherla & Hu (2008)	eCRM		Y						Y			Y	Y	
Ramsey et al. (2008)	Tech								Y			Y		
Abou-Shouk et al. (2013)	eCoM		Y						Y			Y	Y	
Yeboah-Boateng & Essandoh (2014)	Cloud Comp		Y			Y			Y					
Agboh (2015)	ICT		Y		Y				Y		Y	Y		
Scupola (2012)	ICT							Y					Y	
Oettmeier & Hofmann (2017)	Tech											Y		Y
Dlodlo & Dhurup (2013)	eMar							Y				Y	Y	
Maduku et al. (2016)	Tech			Y					Y			Y		Y
Tutusaus et al. (2018)	ICT	Y							Y					
Zhu et al. (2006)	Tech	Y										Y		
Musawa & Wahab (2012)	EDI											Y		
Khalifa & Davison (2006)	IT								Y			Y		
Sarosa & Zowghi (2003)	RFID	Y	Y	Y				Y	Y			Y		
Van Akkeren & Cavaye (1999)	IT		Y						Y			Y		
Keoy et al. (2006)	eBus	Y												
Alzougool & Kurnia (2008)	eCom	Y						Y				Y	Y	
Weber & Kauffman (2011)	ICT				Y	Y								
Bayo-Moriones & Lera-López (2007)	ICT										Y	Y		
Deng & Ji (2015)	IT								Y			Y		Y
Abu-ELSamen et al. (2010)	Tech		Y				Y	Y						
Messerschmidt & Hinz (2013)	Tech		Y					Y	Y	Y		Y	Y	
Al-Qirim (2007)	eCom			Y	Y			Y				Y		Y
Pan (2005)	IT	Y	Y									Y		
Mehrtens et al. (2001)	Intrnt				Y				Y					
Rahayu & Day (2015)	eCom			Y				Y	Y			Y		
Consoli (2012)	ICT	Y							Y			Y		
Lin (2014)	Tech		Y									Y		
De Marez et al. (2007)	Tech													Y
Brown & Russell (2007)	RFID											Y		Y
Zailani et al. (2015)	RFID	Y												Y
Nedbal et al. (2014)	Cloud Comp													Y

3.2 Analytics

Present-day organisations need to possess cutting-edge skills such as analytical capabilities. Data analytics, advanced analytics or simple analytics is used to leverage the data to augment logical decision-making by businesses (Demirkan & Delen, 2013; Ahmed et al., 2022). Analytics helps to understand the hidden predispositions from the data to create valuable insights which are beneficial to the firms. The decision-makers, as well as the eminent scholars of analytical capabilities, lead to improving the performance of the supply chains as anticipated (Wang et al., 2020). There is an advent in the use of analytics by many firms owing to its benefits, such as improved decision-making (Deng & Ji, 2015; Ogbuke et al., 2022). However, the prominence of analytics is mostly limited to developed countries. Most firms operating in emerging markets are oblivious to the advantages of using analytical platforms (Chehbi-Gamoura et al., 2020; Chi et al., 2020).

The acquisition of analytics by the firms depends on the ability of the firms to acquire desired resources (Wu et al., 2016; Wang et al., 2020). The fundamental premise for this perspective is the resource-based view (RBV). Barney (1991), through RBV, stressed that the resources possessed by a firm should be valuable, rare, inimitable and non-substitutable (VRIN). Furthermore, RBV stresses that for a firm to be competent, it needs to possess strategic resources (Barney et al., 2001). Once possessed, these resources need adequate management. Management or orchestration of tangible and intangible resources includes restructuring, bundling and using the resources strategically (Sirmon et al., 2011; Hitt et al., 2016). The proposition for this theoretical approach is that RBV suggests adopting various tools and skills by the firms, and analytics is considered a valuable resource for the firms operating in the present-day industry and business environment (Golan et al., 2020).

Interestingly, analytics can provide insights into the trends of the market, customer preferences and supplier proficiency (Hwang & Min, 2015; Nguyen et al., 2015). Analytics can be applied in strategic management, product development, customer service and logistics administration (Thakkar et al., 2008; Wang et al., 2020). Analytics enhances the decision-making capabilities of the firms by aiding the several functions involved in the supply chains and decisions like planning, procurement, inventory, production and logistics, including reverse logistics (Abu-ELSamen et al., 2010).

The use of analytics leads to the formulation of competitive strategies and the operational practices followed by the firms. Effective results and insights can be ensured with evidence-based data, which is statistically and operationally analysed using forecasting, optimisation and predictive techniques (Wamba et al., 2020; Sainy et al., 2022). Analytics includes the treatment of huge data sets with the application of statistics, econometrics, mathematics, simulations and optimisation techniques, to name a few. Analytics can be classified into four categories: descriptive, diagnostics, predictive and prescriptive (Banerjee et al., 2013; Demirkan & Delen, 2013; Wang et al., 2020).

3.2.1. Adoption of Analytics and Ripple Effect

Contemporary firms are subjected to a lot of timely information about the whereabouts of the products in the supply chain at different levels (upstream to downstream) (Gunasekaran et al., 2017; Ahmed et al., 2022). Now, using analytical platforms and capabilities, this information can be leveraged by firms to increase their efficiency through focused decision-making (Muriithi et al., 2016). Analytics facilitates relevant decision-making with the use of a large amount of internal and external data, which is at the managers' disposal. Analytics can help decision-makers in dealing with dynamic market conditions by assessing the supply chain risks (Zhang & Dhaliwal, 2009; Messerschmidt & Hinz, 2013). Analytics can be used in the end-to-end activities of the supply chain, right from planning to delivery (Trkman et al., 2010; Seyedan & Mafakheri, 2020).

Analytics helps in improving the prediction of market trends. Analytics in the supply chain is pertinent right from the planning stage to procurement, manufacturing, delivery and return of the products to the firm. The skilful manoeuvre of these activities helps in the improvement of the supply chain performance (Nguyen et al., 2015; Chehbi-Gamoura et al., 2020; Koot et al., 2021). Analytics can stimulate supply chain capabilities that come from formulating implementable and cutting-edge supply chain strategies. Analytics improves visibility across the chain and, thus, reduces the Ripple effect in the supply chain. The Ripple effect relates to the dynamics of the structures of the supply chains. It is defined as the upstream and downstream proliferation of the disruptive event in the value chain from a particular point to a node in the chain (Dolgui et al., 2018; Hosseini & Ivanov, 2019; Ivanov & Dolgui, 2020).

4. Propositions

The identified enablers were included in the proposed conceptual model (Figure 1). These enablers were shortlisted based on their anticipated implications for

managerial decision-making in accordance with their significance in the literature. It is projected that obliviousness towards any of these environmental parameters can lead to resistance to the adoption of analytics by firms. Optimum management of these enablers is prerequisite and imperative for the analytical transition of the firms. Therefore, these are vital environmental enablers for facilitating the adoption of analytics by firms.

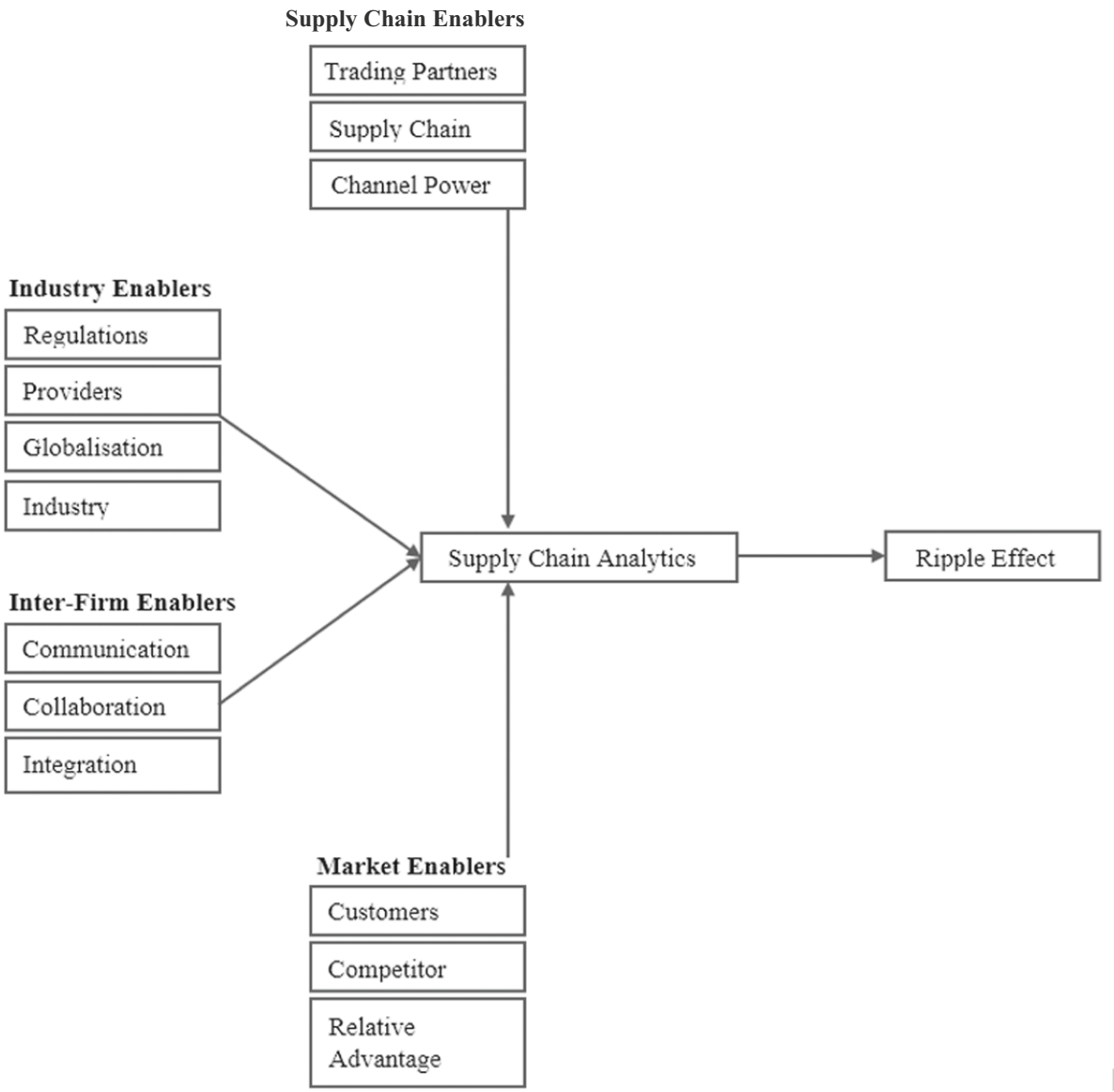

Figure 1. Conceptual Framework

4.1 Supply Chain Enablers

Trading partners often influence each other. Better coordination and compatibility among the trading partners help in minimising the costs of doing business and thus increase the efficacy of the collaboration (Zhang & Dhaliwal, 2009). Smooth information sharing can enable the desired harmonious association since information visibility can be enabled with technological upgradation. Trading partners influence each other in adopting similar technological platforms (Nikas et al., 2007; Messerschmidt & Hinz, 2013). Other supply chain management-related factors also have an impact on the adoption of technologies in the firms operating in the chain (Abu-ELSamen et al., 2010). For example, trust is imperative in the supply chain to enable technology among firms. The need for collaborative planning in the supply chain also encourages the adoption of identical technologies by the supply chain partners (Jharkharia & Shankar, 2004; Luken & Van Rompaey, 2008). Similarly, the researchers studying the adoption factors for various forms of technologies (Fawcett et al., 2007) have also acknowledged the influence of channel power. Hence, the researchers propose the following:

RP1: a) Trading Partners, b) Supply Chain Management and c) Channel Power has a positive impact on the adoption of Analytics.

4.2 Industry Enablers

Researchers studying the adoption of various technologies have proposed and acknowledged the role of regulatory authorities in driving the technological up-gradation by firms (Troshani & Doolin, 2005; Tutusaus et al., 2018). Regulations motivate and, at times, even mandate the adoption by the firms (Luken & Van Rompaey, 2008; Triguero et al., 2013). Apart from the role of regulatory requirements in adoption decisions (Alzougool & Kurnia, 2008), the availability of the providers of technology also plays an equally important role (Sarosa & Zowghi, 2003). The availability of good quality vendors and service providers has been acknowledged as a crucial aspect of the adoption decisions by the firms (Attaran, 2007; Ghobakhloo et al., 2011). The consultants' professional incapability hampers implementation processes and severely affects the post-adoption performance of such systems (Al-Qirim, 2007; Maduku et al., 2016).

Globalisation acts as a catalyser for the adoption of technological platforms (Lee et al., 2013). This is due to the fact that the firms that want to operate and perform at a global level somehow become dependent on innovative ways of conducting their businesses. Technological platforms help overcome the hindrances of the physical ways of carrying businesses (Fawcett et al., 2007; Luken & Van Rompaey, 2008). Besides the macro-level factor of globalisation, micro-level factors such as the industry also influence the predisposition towards adoption decisions. For example, industrial characteristics act as important external factors that influence the firms' innovation adoption decisions (Priyadarshinee et al., 2017). Industrial convergence towards adoption decisions could be either vertical, within the industry, or horizontal, which implies the influence across the related industries (Sharma & Citurs, 2005; Scupola, 2012).

Rp2: a) Regulations, b) Providers, c) Globalisation and d) Industry have a positive impact on the adoption of Analytics.

4.3 Inter-Firm Enablers

Firms willing to adopt new technologies should develop communication platforms (Bandyopadhyay & Sen, 2011; Oliveira et al., 2014). Communication infrastructure enables a smooth transition of the technological platforms since communication technology such as IP provides a facility for uninterrupted end-to-end transmission of messages and information among the devices (Zhang & Dhaliwal, 2009; Kannabiran & Dharmalingam, 2012). It was found from the literature review that collaborations with other firms have been considered an important enabler by many researchers (Gupta et al., 2013; Nguyen et al., 2015). Collaboration refers to the capability to connect to the business partner through homogenous technological platforms (Yeboah-Boateng & Essandoh, 2014; Astri, 2015). Moreover, integration is also important for the smooth transition to the technological platforms (Goktas et al., 2013; Phaphoom et al., 2015). The firms may integrate vertically and horizontally. The fully integrated firms can exercise more control and are more empowered as well (Jharkharia & Shankar, 2004; Ugwu et al., 2003).

Rp3: a) Communication, b) Collaboration and c) Integration have a positive impact on the adoption of Analytics.

4.4 Market Enablers

Regardless of the industry sector or the product, customers are the core of any business decision, more so for the strategic decisions undertaken by the firms. All the firms want to retain their existing customers, and at the same time, they pursue to woo and attract new customers (Lee et al., 2013; Lee & Mangalaraj, 2022). Technology proves to be a

medium for achieving this target because it facilitates the persuasion of customers by the firms (Messerschmidt & Hinz, 2013). In addition, competitive scenarios exert pressure on firms for making and implementing strategic decisions. For example, if the competitors adopt a certain practice, then the focal firms may also want to match their capabilities (Koot et al., 2021).

The firms do not want to take chances in lagging behind the rival firms in servicing the existing customers and attracting the newer ones. Strategies and decisions influenced by the competition often lead to restructuring the industries (Rahayu & Day, 2015; Dubey et al., 2021). The underlying assumption and expectation from any major strategic decision taken by the businesses is the relative advantage. The firms' wish to succeed from their rivals and to become business leaders lead them to take drastic measures such as the introduction of new products or advancing technological platforms (Maduku et al., 2016; Alkhater et al., 2018).

Rp4*:* a) Customers, b) Competition and c) Relative Advantage have a positive impact on the adoption of Analytics.

5. Analytics and Ripple Effect

Supply chain management includes the administration of both tangible (equipment, cost) and intangible (patents, capacity utilisation) factors, which involve management of inventory, lead time, buyer-supplier relationship, efficiency and the likes (Goyal & Randhawa, 2008; Parashar et al., 2020). The performance of the supply chain influences the firms comprising the supply chain, which leads to increased competitive advantage (Sezen, 2008; Alderete & Gutiérrez, 2014). However, a rather cautious implementation of the decision systems is required to increase the supply chain performance (Ivanov & Dolgui, 2020; Sangeetha et al., 2022). Analytics in the supply chain can add value in handling visibility, demand volatility and cost fluctuations; hence, firms are adopting the existing as well as new forms of advanced analytics (Ahmed et al., 2021; Iftikhar et al., 2022).

The Ripple effect is described as the "impact of a disruption on supply chain performance and disruption-based scope of changes in the supply chain structures and its parameters" (Ivanov et al., 2015). The Ripple effect can be understood as a phenomenon wherein the impact of an operational occurrence moves beyond the origin of that event or disruption. In simple terms, the Ripple effect can be understood as the “supply chain disruption propagation” in which the issue at one node of the values chain is accelerated towards the other nodes. The impact of the Ripple effect on the performance of businesses cannot be ignored (Li & Zobel, 2020; Li et al., 2020). By avoiding the Ripple effect, business leaders can essentially control the further diffusion of operational disruptions from one entity to another (Yılmaz et al., 2021). When the disturbances disseminate across the supply chain, they influence the planning, structural design and supply chain performance; and are known as the Ripple/Domino effect (Lohmer et al., 2020).

The Ripple effect is different from the Bullwhip effect in that the Ripple effect changes the supply chain design, unlike the Bullwhip effect, which is confined to the mismatch in the demand and supply. The Ripple effect happens when disruption spreads across the entire supply chain affecting its performance instead of affecting only a particular part of the supply chain (Koot et al., 2021). Therefore, a powerful risk mitigation strategy such as data analytics should be incorporated to tackle the issues related to the Ripple effect. Many firms are already using analytical capabilities to handle disruptive scenarios. For instance, DHL has started digitising its supply chain by using cloud-based analytical platforms like Resilience360 to prepare itself for disruptions with evaluative measures to mitigate the impact. Such platforms help construct risk profiles, identify critical hotspots and map end-to-end SC ("About Us| DHL Resilience360", n.d.). The information enables the firms to lessen the Ripple effect. Hence, it becomes a prerequisite for firms to possess data processing capabilities, as revealed through the organisational information-possessing theory (Kannabiran & Dharmalingam, 2012).

Data analytics is the science used to treat data to enhance logical decision-making. Analytics helps to understand trends and patterns to create insights. Unfortunately, there are firms oblivious to the benefits of using analytics (Ogbuke et al., 2022). Interestingly, analytics can also provide valuable insights into customer preferences and supplier proficiency (Hwang & Min, 2015; Iftikhar et al., 2022). The application of analytics can be found in strategic management, planning, procurement, inventory, production, product development, customer service and logistics administration (Thakkar et al., 2008; Abu-ELSamen et al., 2010).

Analytics includes the treatment of huge data sets with the application of statistics, econometrics, mathematics, simulations and optimisation techniques. Analytics can be classified into four categories: descriptive, diagnostics, predictive and prescriptive (Banerjee et al., 2013). Descriptive statistics assist in understanding the patterns. Diagnostic analytics with visualisation techniques helps in

root cause analysis of the problems and understanding the reason for the occurrence of the events. Predictive analytics helps to predict future trends, such as the change in the preferences of consumers. Finally, prescriptive analytics goes a step beyond by determining future possibilities and courses of action for businesses (Demirkan & Delen, 2013).

Based on the above arguments, through a review of highly indexed, peer-reviewed research papers from the field of data, information, supply chain and capability, the authors propose that:

Rp5: Adoption of analytics is negatively related to the Ripple effect.

6. Conclusion and Implications

Today's global business environment relies a lot on interconnected technologies which lead to the generation of a lot of data at various stages of the supply chain (Chehbi-Gamoura et al., 2020; Wamba et al., 2020). Availability and abundance of data enable the generation of opportunities for the firms to benefit from their analytical capabilities, unlike the conventional supply chains, which used to suffer from a dearth of information exchange (Arunachalam et al., 2018). The widespread disposal of data has led to an enormous acceptance of analytics. Analytics is going to be a critical business capability that has the potential to provide better means for companies to create value from the data for gaining a competitive advantage. There are many issues facing supply chain management, like delays in shipments, fluctuating prices of fuel, supplier management, fulfilling customer expectations and wastage (Lambert & Enz, 2017; Seyedan & Mafakheri, 2020). The adoption of analytics has the potential to become a solution for resolving these issues. Analytics is expected to improve the overall visibility in the supply chain operations, leading to a decrease in the Ripple effect and thus improving performance (Li et al., 2020; Sangeetha et al., 2022).

Through this research work, the authors have proposed that certain firm-specific factors influence the intention of the adoption of analytics by firms. Emphasis on the discussed enablers will make the firms better prepared and inclined towards the adoption of technological platforms. These enablers drive the planning and execution of a firm for the adoption of analytics. This research is intended to add to the existing body of literature related to the topic. The use of analytics in the supply chain increases the performance of the entire supply chain. Therefore, it is prudent for managers to invest more resources and time in understanding and developing analytical capabilities through collaboration with partners (Brock & Khan, 2017; Arunachalam et al., 2018) for the improvement in the performance of their firms. As discussed in the paper, managers drive the adoption of capabilities in various ways. Moreover, it is important to note that managers not only enable the adoption of analytics but also contribute to the alignment of the firm's capabilities with any such change and adoption, which ultimately affects the firm's performance (Demirkan & Delen, 2013; Golan et al., 2020).

Incidentally, the firms are laden with a lot of data pouring from all directions and dimensions. The high volume and variety of data are inundated to the extent that it has become challenging for firms to distinguish useful data from redundant data (Maheshwari et al., 2020; Iftikhar et al., 2022). Data becomes valuable when it can be transformed into beneficial information. Information makes the firms better prepared for disruptions and other unforeseen risks encountered by the firms otherwise (James & George, 2018; Wamba et al., 2020). Data can help manage the supply chains better with the least waste. For instance, the firms operating in the food supply chain per se face trade-offs between responsiveness and efficiency. This trade-off is more persistent for supply chains of perishable products owing to the low shelf life of such products.

As is evident in today's dynamic business environment, complexities of the contemporary supply chains have led to amplified risk; firms operate in various risks such as density risk, proximal-supplier-relationships risk, environmental risk and local environment risk (Mohan, 2021). Hence, resilient capabilities have become imperative for firms to survive and flourish (Li & Zobel, 2020; Lohmer et al., 2020). If the firms do not possess information, it leads to ambiguity and makes the operations more challenging. The increased wisdom from appropriate and timely information may help the firms improve their resilient capabilities. Further, information also makes the firms lessen the Ripple effect (Hosseini & Ivanov, 2019; Ivanov & Dolgui, 2020). Hence, it becomes a prerequisite for firms to possess data processing capabilities, as revealed through the organisational information-possessing theory.

Moreover, contemporary firms are burdened with the responsibilities of not only safeguarding performance for themselves but also ensuring that profits are earned by implementing sustainable approaches (Parashar et al., 2020). With the newly realised awareness regarding sustainability among the regulators as well as consumers, the firms have followed the league to adapt and adopt sustainable measures because a) they are bound by the

legislations and policies and b) they want to use it as branding to woo and retain consumers. Now, data can help firms achieve closed-loop supply chains so as to be sustainable as well as reduce ripple effects at the same time (Dolgui et al., 2018).

7. Limitations and Future Scope

This conceptual paper serves as a foundation for future research that would be beneficial for both researchers and practitioners. However, there are certain limitations which provide scope for future research. First, a more detailed and comprehensive study is desirable. Given that, this study explored the role of environmental enablers in the adoption of analytical capabilities. There could be several other factors not included in this research work. Factors related to the technology might also affect the discussed adoption. Moreover, this study does not take into consideration the technology acceptance model. Secondly, factor analysis may be used to categorise the enablers as per the defined categories. The proposed model needs to be empirically tested. There is a need to validate the discussed relationship with the help of empirical analysis, experimental research and simulation, etc. Findings from such research would provide validations for the proposals made in this study. Lastly, the present research work opens opportunities for future research in several aspects, such as the role of supply chain digitalisation; the use of complexity theory, the role of competition, dynamics and control, as well as the incorporation of human factors in ripple effect analysis.

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Is Top Management Support Relevant in the Implementation and Post-implementation Phases of Cloud ERP in SMEs? Evidence from Malaysia

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Abstract

One of the most important success factors that pervade all organisational processes, including the implementation of innovative information technology (IT) like cloud ERP is top management support (TMST). However, it is unclear if top management needs to support both the implementation and post-implementation of cloud ERP. Hence, this paper aims to examine the effect of TMST on cloud ERP implementation and its subsequent influence on financial performance (FPC). In addition, the moderating role TMST plays in the cloud ERP implementation (CERPI)-FPC relationship is investigated. A research model based on the resource-based view (RBV) theory was developed and tested on a sample of 204 Malaysian small and medium enterprises (SMEs) in the manufacturing sector. Using the statistical technique of partial least squares structural equation modelling (PLS-SEM), this study finds TMST as an enabler of CERPI, which positively impacts FPC. Furthermore, TMST has no moderating effect on the CERPI-FPC relationship. This research extends the current IT literature by providing insight into the boundary of TMST in the implementation and post-implementation stages of cloud ERP. This study's findings can guide SME owners, top management, and other key decision-makers during the cloud ERP diffusion process.

Keywords: *Cloud ERP implementation, top management support, moderation, Malaysia, SMEs*

1. Introduction

Computing resources such as storage, servers, software, networks, database systems, and other resources can be accessed via the internet and paid for on a pay-per-use basis through cloud computing (CC) (Marston et al., 2011). Cloud ERP is one of the CC services or software that can help businesses of all sizes, particularly SMEs, make faster decisions and achieve a competitive advantage. A cloud ERP system improves collaboration across multiple functional units in an organisation in order to efficiently strategise and manage the entire company's resources (AL-Shboul, 2018; Gupta et al., 2018). One significant advantage of cloud ERP for SMEs is the ability to use ERP systems without investing in costly IT infrastructure (Fosso-Wamba et al., 2015; Gupta et al., 2018). SMEs can compete with larger firms by using a low-cost, innovative, and competitive ERP system via cloud ERP, according to Wrycza (2011). Furthermore, SMEs prefer cloud ERP for its scalability, simplicity of control, and, most crucially, lower licencing, maintenance, and overall investment costs (Alsharari et al., 2020; Wrycza, 2011). Despite the fact that there are numerous advantages to using Cloud ERP, many SMEs are hesitant to deploy it.

Many studies have highlighted numerous critical success factors for cloud ERP implementation, including relative advantage, cost savings, interoperability, top management support (TMST), privacy and security, competency, and technological readiness (AlBar & Hoque, 2019; AL-Shboul, 2018; Asiae et al., 2019). TMST, on the other hand, is regarded as the most critical success factor in the implementation of cloud ERP (AlBar & Hoque, 2019).

An organisation's top management allocates the resources needed for cloud ERP adoption and approves the project before it is implemented (Holland & Light, 1999). Furthermore, top management's dedication and support keep employees motivated (Françoise et al., 2009).

Many organisational practises and behaviours are influenced by TMST, including technology adoption (Hsu et al., 2019), project success (Young & Jordan, 2008), environmental protection (Colwell & Joshi, 2013), and company performance (Ooi et al., 2018). As a result, besides the implementation stage, a few empirical studies have also confirmed that TMST is important at the post-implementation stage of cloud ERP (Shee et al., 2018). Meanwhile, the studies on the importance of TMST were conducted independently in the implementation and post-implementation phases.

Since TMST is critical in the implementation and post-implementation stages unconnectedly, it is unclear if TMST, as advocated by Huang and Yasuda (2016), is concurrently relevant in both stages. According to Ha and Ahn (2014), despite the importance of top management, it is often practically difficult for them to be consistently and actively involved in ERP operations after the implementation stage. This argument parallels the proposition of Young and Jordan (2008) that there are circumstances where TMST might be sufficient, excessive or improper and called for future research in this direction. Hence, this research answers this call from the cloud ERP implementation perspective. Therefore, in addition to testing the direct effect of TMST during the implementation phase of cloud ERP, this study also assesses TMST's moderating effect during the post-implementation phase.

This could help to explain the inconsistent findings regarding CERPI and performance. For instance, some research discovered a significant relationship (Gangwar, 2017; Garrison et al., 2015), while others found an insignificant relationship (Cámara et al., 2015; Novais et al., 2020).

According to Sexton and Upton (1987), a firm's performance is the result of top management's decisions and human interactions rather than a natural phenomenon. On the basis of the same logic, TMST may moderate the latter stage of CERPI. Thus, this paper contributes to the burgeoning literature on CC by being one of the first attempts to investigate the relevance of TMST in the implementation and post-implementation phases concurrently, thereby expanding the literature on CC that primarily focuses on the role of TMS in the implementation and post-implementation phases independently.

The remaining parts of this paper are based on the following: the next section presents the theoretical background of the study, the review of the literature, and the hypotheses development. Then, in section 3, the methodology is presented. Analysis of data and findings are contained in section 4. Section 5 presents a discussion of the findings, followed by theoretical and practical implications, limitations, and recommendations for future studies. The last section, Section 6, focuses on the conclusion of the study.

2. Theoretical Background

Based on Barney's (1991) RBV theory, valuable, rare, inimitable, and non-replaceable (VRIN) capabilities and resources give organisations a competitive advantage and higher performance. The RBV theory postulates that a

business can gain a competitive advantage by combining resources and capabilities (Gupta et al., 2018). According to Grant (1991), resources and capabilities should be distinguished. In Grant's definition, resources are factors that can be accessed and controlled. The ability of a company to use business procedures and resources in order to achieve its goals is referred to as its "capabilities." From the perspective of realising the business value of CC, most of the existing research mainly draws upon the RBV theory (Chen et al., 2022). Recently, building on RBV, Liu et al. (2020) applied RBV to assess the role of CC on internal operations, external integration, and organisational innovation and reached a conclusion that CC creates value and better performance for firms. Chen et al. (2022) used the theoretical lens of RBV to evaluate the influence of CC on the performance of globally listed firms that implemented CC between 2010 and 2016. CC was reported to enhance the market value and profitability of the listed firms in both short and long term differently. Jayeola et al. (2022) used the RBV as a theoretical undergirding to examine how the combination of cloud ERP implementation and top management support on change management as VRIN resources impact SMEs' financial performance. Mitra et al. (2018) used the RBV and focused on the association between CC adaptation and firm growth and discovered that CC is capable of providing unique capabilities for companies to enhance their operational performance. Gangwar (2017) utilised the RBV theory to explain how CC usage integrated with other firms' resources and capabilities resulted in better business performance. According to Utzig et al. (2013), CERPI can be used to create unique business strategies. As a consequence of this, companies can make use of TMST as a capability to effectively integrate cloud ERP as an IT resource. In addition, since IT adoption has been criticised as a commodity procurement without effectual use or strategic alignment, this study conceptualises cloud ERP implementation based on two dimensions, namely strategic alignment and usage (Fuzes, 2018; Ilmudeen et al., 2019). This is in line with the argument of Liu et al. (2020) that cloud-based services are not a unique resource because of their wide availability to all business competitors. Further, they asserted that the level of using the technology differently and strategically integrating it with the firm's business processes could make it inimitable and provide better performance to firms. Therefore, we contend that cloud ERP, strategically aligning it with the firm's objectives, its usage and TMST coupled together, according to Barney (1991), will provide enterprises with a competitive advantage difficult to imitate, which would finally enhance the financial performance of firms.

3. Literature Review and Hypotheses

3.1 Top Management Support and Cloud ERP Implementation

TMST is critical in the adoption of new technologies (Liang et al., 2007), and it is widely recognised in the literature as a significant factor in IT project success (Maduku et al., 2016). Top management can give appropriate resources and support for ERP implementation (Ha & Ahn, 2014). Top management training familiarises staff with cloud ERP functions and allows them to conduct their tasks in a better and more effective manner (Françoise et al., 2009). In order to accommodate the business processes that are already built into the design of cloud services, implementing cloud ERP requires reengineering existing business processes (Ramachandran, 2013). This business process reengineering could induce fear of job loss and employee resistance to change, thereby increasing the likelihood of inadequate cloud ERP integration (Wang et al., 2019). In truth, many CC projects have failed as a result of organisational resistance (Kuo, 2011). TMST has been validated as a key component for tackling organisational resistance and assuring effective IT implementations. This is because TMST allows for better visibility and control over IT projects (Elbanna, 2013). According to the findings of several empirical research studies, there is a positive relationship between TMST and CERPI (AL-Shboul, 2018; Oliveira et al., 2014). Consequently, the following hypothesis is put forward:

H1: Top management support positively impacts cloud ERP implementation.

3.2 Cloud ERP Implementation and Financial Performance

In a broad sense, the adoption of IT enables businesses to improve their performance by expanding their market share, raising their productivity, securing a customer-oriented stance, enhancing product and service advancements, and reacting more quickly to shifting market dynamics (Cardona et al., 2013; Tran et al., 2014). Because of this, the adoption of technology is only of critical importance when it significantly boosts the performance of the firm (Yunis et al., 2018). Schniederjans and Hales (2016) stated that CC positively influences the economic performance of companies in the United States. According to Jayeola et al. (2020) and Al-Sharafi et al. (2019), the adoption of cloud ERP software was found to be an essential factor in improving the business performance of Malaysian SMEs. Shee et al. (2018) conducted research on Australian retail companies and found that cloud-enabled supply chain

integration was related positively to supply chain performance, which in turn boosted the sustainability of firms. The implementation of cloud ERP systems has also been linked to the sustained success of Indian-based technologically advanced international companies (Gupta et al., 2020). Cloud-based ERP software has the prospect of becoming the single most important catalyst for the performance of the company (Gupta et al., 2020). Cloud ERP facilitates the amalgamation of various cross-functional business activities, which in turn improves operational efficiency and performance. Faasen et al. (2013) found that when cloud ERP software is used well, it can significantly improve a company's competitive edge and bottom line. Consequently, the following hypothesis is developed:

H2: Cloud ERP implementation positively impacts financial performance.

3.3 The Moderating Impact of Top Management Support

The moderating influence of TMST on the major proposed relationships in the current study (CERPI and FPC) is a relationship that many technology implementation studies seem to gloss over. It is essential to consider moderating variables when attempting to explain contradictory findings across multiple studies (Purnomo & Nastiti, 2019), especially in the cloud ERP context where findings have been inconsistent. For example, some studies found a significant relationship (Gangwar, 2017; Garrison et al., 2015), while others found no significant relationship (Cámara et al., 2015; Novais et al., 2020).

This study is specifically interested in investigating the role that the TMST plays as a moderator factor in the relationship between CERPI and FPC at the firm level. The ultimate goal of top management in properly managing technological deployment is improved performance. As a result, Powell (1995) argued that a company's long-term strategic orientation, which includes creating a competitive advantage and enhancing performance, depends on the commitment of its top management. The empirical literature shows that securing the support of top management is essential for an organisation's success (Lo et al., 2016). As Fernandes et al. (2014) revealed, companies can improve their performance by having a positive attitude toward and support for innovation at their top management levels. According to Salwani et al. (2009), top management perceptions have a significant impact on the potency of technological advancement to create value in companies. This study proposes that TMST positively moderates the relationship between CERPI and FPC. When cloud ERP is introduced, organisational members might need TMST to improve their utilisation, which will improve the firm's financial performance. The top management can assist other users by disseminating information regarding the significance of adequate usage of cloud ERP, providing staff who are falling behind with training, and offering financial and non-financial incentives to employees that use the cloud ERP effectually. Using the following mechanisms as justification, the next hypothesis is proposed:

H3. When top management support is high, there will be a stronger relationship between the implementation of cloud ERP and financial performance.

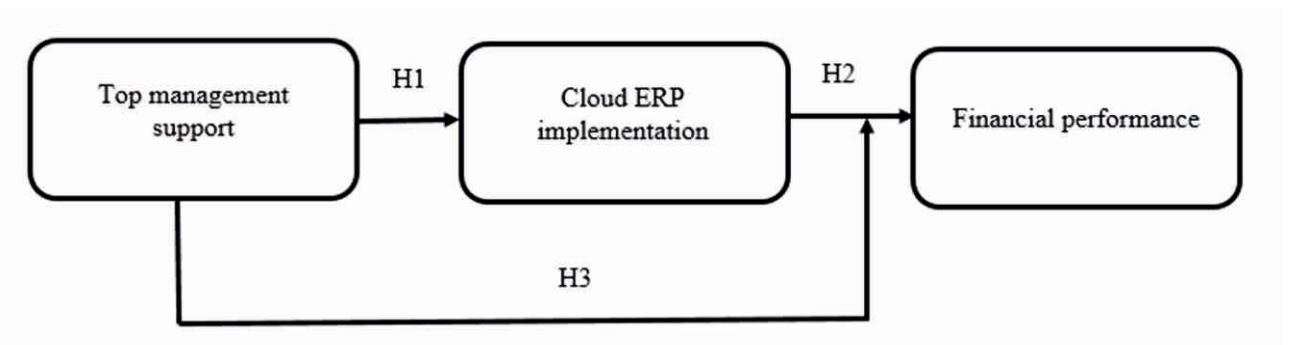

Figure 1. Research model

4. Methodology

The sample of this study is made up of manufacturing SMEs. Manufacturing SMEs were selected particularly because they have long been considered heavy ERP users (Usman et al., 2019). According to the Department of Statistics Malaysia (2016), the highest concentration of SMEs is in Selangor, Kuala Lumpur and Johor, with 19.8%, 14.7% and 10.8%, respectively. Hence these three states and the capital city were selected for sampling purposes, and the targeted manufacturing SMEs must have successfully implemented cloud ERP. The questionnaire of this study was pretested and pilot-tested before main data collection. For the pre-test, three top-level managers of SMEs were recruited, in addition to a senior academic expert in the technology management field. The suggestions of these experts were taken into consideration, and some revisions were made to improve the clarity and utility of the questionnaire.

For data collection, the online survey approach was employed, where the Google forms were sent to the emails extracted from the SME Corp Malaysia and Federation of Malaysian manufacturers directories. The data collection was conducted from January 2021 to April 2021. Thirty manufacturing SMEs were selected for the pilot test; subsequently, they were not included in the main survey. The Cronbach α scores were all above 0.7, which established the validity and reliability of the tool. Owners of SMEs and top management level respondents were selected for this study because they are better familiar with a firm's strategic procedures, to which CERPI belongs (Tajeddini & Mueller, 2012). A stratified sampling technique was applied in which each of the three states and capital cities represented a stratum from which the sample was drawn. One thousand and twenty online questionnaires were sent to SMEs' emails. Two hundred and eight were duly completed and returned, thus, representing a twenty percent response rate. However, only two hundred and four were found useable for further analysis since four of the questionnaires were filled by big firms. Because the mandatory online questionnaire was designed, there were no records of missing data. The Likert scale of 1-5, ranging from strongly agree to strongly disagree, was used to measure the main constructs. Common method bias (CMB) is a critical issue when the respondents answer both independent and dependent constructs questions (Podsakoff et al., 2003). To control for CMB is not straightforward, and researchers need to ensure it is controlled (Podsakoff et al., 2003). To control for CMB, Harman's one-factor method was applied. All indicators of each construct were subjected to factor analysis via principal component analysis. The results revealed that the first factor (construct) could explain 44.8% of the total variance of all the constructs. Since the total variance explained by the first factor was less than 50% (Podsakoff et al., 2003), it can be concluded that CMB is not a problem in this study. The descriptive analysis has shown that owners of SMEs made up 48.5% of the sample, with a majority (69.6%) of the respondents aged between 21-50. BSc was the qualification of most (39.7%) of the sample. The sample was dominated by females (54.4%) and small businesses (49%). Many (76%) of the SMEs implemented cloud ERP about three years earlier, and the largest proportion (80.4%) were using the public cloud ERP. The food, beverage and tobacco sector of the manufacturing SMEs made the highest percentage (17.6%) of the sample. The constructs' (TMST, CERPI and FPC) measurements were adapted from prior studies. TMST was measured with 8 items adapted from Gutierrez et al. (2015) and Wang et al. (2010). CERPI was measured with 2 dimensions, namely "usage" and "strategic alignment". Usage was adapted from the study of Gangwar (2017) with 3 items. Strategic alignment was adapted from Chiu and Yang (2019) with 9 items Finally, FPC was adapted from Jayeola et al. (2022) with 5 items.

5. Data Analysis and Findings

The partial least squares-structural equation modelling (PLS-SEM) was used to analyse the data collected. The reasons for selecting PLS-SEM as opposed to its counterpart covariance-based (CB) SEM are: (1) The skewness and kurtosis scores were above -1 and +1, an indication that the data was not normally distributed, (2) The sample is not large, only 204, (3) the study is exploratory rather than confirmatory (Hair et al., 2011, 2014). Smart PLS 3.3.2 software was applied for the analysis.

5.1 Measurement Model

According to Hair et al. (2014), a measurement model evaluates the reliability, discriminant and convergent validity of the constructs, usually referred to as confirmatory factor analysis (CFA). Out of the three constructs used in this study, TMST and FPC are lower-order constructs (LOCs), while CERPI (strategic alignment and usage as sub-constructs) is a higher-order construct (HOC). The two LOCs were measured reflectively, while the HOC was measured on a reflective-reflective basis in accordance with the literature review (Sarstedt et al., 2019). In the specification and estimation of the HOC, a disjoint two-stage approach was used (Sarstedt et al., 2019). In this approach, the antecedent pathways were routed directly to the LOCs of

the HOC by excluding the HOC in the first stage. In the second stage, the latent scores of the LOCs were saved and used for analysis. Table 1 shows the reliability and convergent validity of the LOCs. For the reliability test, the composite reliability (CR) values should be 0.7 above (Hair et al., 2011). The CR values ranged between (0914-0.971), hence, the constructs' internal consistencies are confirmed. The indicators' reliability is guaranteed based on the factor loadings of the constructs' indicators being higher than 0.7 (Hair et al., 2010). In addition, the average variance extracted (AVE) values are all greater than the 0.5 threshold suggested by Fornell and Larcker (1981). Therefore, the convergent validity of the constructs is affirmed. Unlike the cross-loadings and Fornell-Larcker criteria, the Heterotrait-Monotrait Ratio (HTMT) has been selected to test discriminant validity because it is robust, new, and has a higher level of specificity (Henseler et al., 2015). In Table 2, the HTMT values are less than the 0.85 threshold suggested by Kline (2011). Hence, the discriminant validity of the LOCs has been established. In Table 3, the reliability and convergent validity of the HOC (CERPI) are evaluated. With the CR value of 0.923, the internal consistency of the HOC is demonstrated. Furthermore, the two LOCs of the CERPI (strategic alignment and usage) have factor loadings that exceed the 0.7 criterion (Hair et al., 2014), thereby confirming their reliability. With the AVE value of 0.858, it can be concluded that the HOC and CERPI have passed the convergent validity test. Finally, in Table 4, the discriminant validity test of the HOC is shown. Since the HTMT values are below the 0.85 benchmark suggested by Kline (2011), the discriminant validity of the HOC is established. In conclusion, as suggested by Sarstedt et al. (2019), this study has fulfilled the reliability, convergent validity and discriminant validity that could be further used to test the structural model.

Table 1. Reliability and Convergent Validity of Lower-order Constructs

Construct	Indicator	Loading	AVE	CR
Top Management Support	TMST1	0.851	0.808	0.971
	TMST2	0.884		
	TMST3	0.918		
	TMST4	0.899		
	TMST5	0.918		
	TMST6	0.935		
	TMST7	0.933		
	TMST8	0.848		
Usage	USG1	0.916	0.780	0.914
	USG2	0.891		
	USG3	0.841		
Strategic Alignment	SAL1	0.868	0.748	0.964
	SAL2	0.838		
	SAL3	0.830		
	SAL4	0.876		
	SAL5	0.879		
	SAL6	0.899		
	SAL7	0.868		
	SAL8	0.854		
	SAL9	0.870		
Financial Performance	FPC1	0.913	0.810	0.955
	FPC2	0.858		
	FPC3	0.897		
	FPC4	0.925		
	FPC5	0.907		

Table 2. Discriminant Validity of Lower-order Constructs (HTMT)

	USG	FPC	SAL	TMST
Usage				
Financial performance	0.401			
Strategic alignment	0.793	0.478		
Top management support	0.523	0.480	0.619	

Table 3. Reliability and Convergent Validity of the Higher-order Constructs

Construct	**Indicator**	**Loading**	**AVE**	**CR**
Cloud ERP Implementation	USG	0.909	0.858	0.923
	SAL	0.943		

Table 4. Discriminant Validity of all Constructs (HTMT)

	CERPI	FPC	TMST
Cloud ERP implementation			
Financial performance	0.496		
Top management support	0.644	0.480	

5.2 Structural Model

Hair et al. (2014) suggested that the variance inflation factor (VIF) should be evaluated prior to the estimation of the structural model in order to ensure there is no multicollinearity issue between the constructs. The value (1.000) of the VIF indicates that there is no problem of multicollinearity in the constructs since this value is below the 3.3 threshold suggested by Hair et al. (2010). Therefore, for estimating the structural model, the following metrics were undertaken according to the recommendations of Hair et al. (2014; 2019): path coefficients, coefficient of determination (R^2), predictive relevance (Q^2), and out-of-sample predictive power of the model (PLSpredict).

5.2.1 Path Coefficient Estimation

The estimation of the path coefficient is used to ascertain the significance or insignificance of the proposed relationships. For a path coefficient to be significant, the t-value should be 1.96 and above, which indicates a 5% significance level (Hair et al., 2014). As depicted in Table 5, we could deduce from the results that TMST has a significantly positive impact on CERPI ($\beta = 0.588$, $t = 10.243$), supporting H1. CERPI also significantly and positively influences FPC ($\beta = 0.447$, $t = 5.924$), supporting H2. The product indicator method of PLS-SEM was used to assess the moderating effect since the constructs are reflectively measured (Hair et al., 2010). As shown in Table 6, the moderating path TMST*CERPI-> FPC indicates the moderating impact of TMST on the CERPI and FPC relationship is insignificant ($\beta = -0.035$, t-value = 0.456), thus rejecting H3. Further, the effect size of the moderating impact was examined using the effect size values of Kenny (2018). According to Kenny (2018), trivial, small, medium and large moderating effect sizes are <0.005, 0.005, 0.01 and 0.025, correspondingly. With a 0.003 effect size (f^2) depicted in Table 6, the moderating effect size is trivial.

In addition, a simple slope analysis in Figure 2 depicts the visual moderating effect. The slope shows that the lowest line (low TMST) is steeper for the CERPI->FPC relationship than the highest TMST line. A suggestion that SMEs with low TMST would experience a higher effect of CERPI on FPC and vice-versa. Nevertheless, such effects are insignificant.

Table 5. Direct Relationship Results

Number	Hypothesis	β	SD	t-value	Result
H1	TMST → CERPI	0.588***	0.057	10.243	Supported
H2	CERPI → FPC	0.447***	0.076	5.924	Supported

*Note: ^{ns} = non-significant, ***p < 0.001, β = Standard Beta, SD = Standard Deviation*

Table 6. Moderation Results

Number	Hypothesis	β	SD	t-value	f^2	Result
H3	TMST*CERPI-> FPC	-0.035^{ns}	0.076	0.456	0.003	Rejected

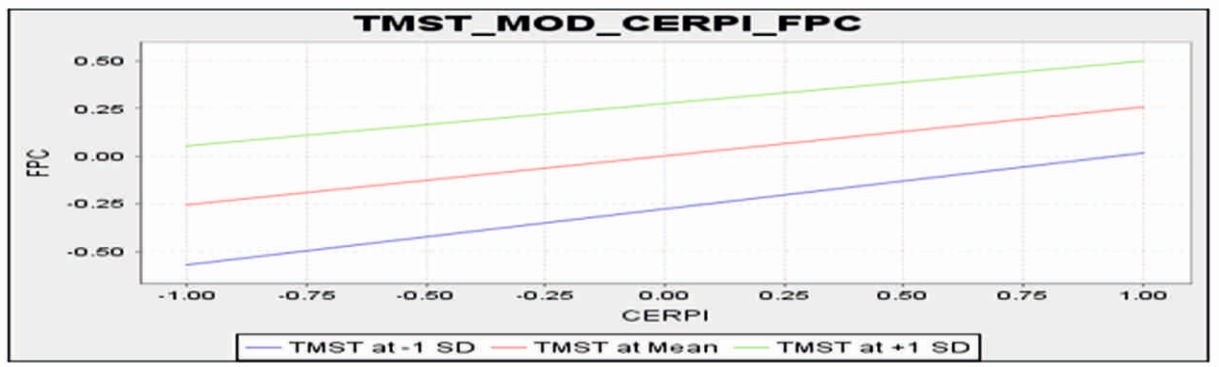

Figure 2. Moderating effect of top management support

5.2.2 Assessment of R^2, Q^2, and PLSpredict

According to Hair et al. (2014), the R^2 measures the model's predictive accuracy, and it can also be recognised as the shared impact of the exogenous variable on endogenous variables. Q^2 is frequently used to evaluate predictive relevance and can be executed using the blindfolding procedure provided by PLS software programmes (Stone, 1974; Geisser, 1974). The PLSpredict measures the out-sample predictive ability of the model (Hair et al., 2019). That is the ability of the model to accurately predict potential respondents that were not part of the actual sample included in the study. The R^2 values of 0.345 and 0.261 for CERPI and FPC indicate that 35% of the variance in CERPI was explained by TMST, while 26% of the variance in PFC was explained by CERPI. Based on Cohen's (1998) R^2 values indication of 0.26 (strong), 0.13 (medium), and 0.02 (weak), it can be concluded that both CERPI and FPC provide a strong explanatory power in the model.

For Q^2, Hair et al. (2021) suggested that values higher than 0 indicate that the model's endogenous constructs possess predictive relevance. Since the Q^2 of the two endogenous constructs (CERPI and FPC) in this study are 0.280 and 0.197, respectively, the model apparently has satisfactory predictive relevance. Lastly, the PLSpredict assessment of the out-sample based on a 10 replications and folds of the hold-out sample data (Hair et al., 2019) was conducted. The root means squared error (RMSE) results for the PLS-SEM and the naive linear benchmark linear model (LM) can be compared in the PLSpredict output. Table 7 shows that most PLS-SEM RMSE values are lower than the LM RMSE values, indicating that this study's model has medium predictive power (Shmueli et al., 2019).

Table 7. PLSpredict

	PLS-SEM		LM	PLS-SEM minus LM
Item	**RMSE**	**Q^2predict**	**RMSE**	**RMSE**
FPC1	0.727	0.138	0.734	-0.007
FPC2	0.745	0.134	0.739	0.006
FPC3	0.710	0.143	0.708	0.002
FPC4	0.687	0.143	0.693	-0.006
FPC5	0.720	0.093	0.730	-0.010

6. Discussion

6.1 Discussion of Findings

This paper explored the relevance of TMST in the implementation and post-implementation stages of cloud ERP on the conjecture that TMST might be too excessive in some circumstances (Young & Jordan, 2008). The study found that TMST is important in the implementation stage of cloud ERP, which subsequently improves the FPC of SMEs. However, this study found that TMST is irrelevant in the post-implementation stage of cloud ERP because it does not significantly strengthen nor weaken the CERPI and FPC relationship.

The empirical analyses of this study indicate that TMST (H1) is a significant determinant of CERPI. This result confirms the prior research that support from top management influences the successful implementation of cloud ERP in the firm, and it is a critical success factor (AL-Shboul, 2018; Oliveira et al., 2014; Qian et al., 2016). The apparent reasons for this are that top management typically has the last word on which technology the business adopts, they can devote the required resources for adoption, and they can ensure that resistance to organisational changes brought about by new technology is minimised (Kinuthia, 2015). Therefore, top management's importance in successful CERPI cannot be underestimated, most especially in SMEs where they are both owners and major decision makers.

Additionally, similar to past studies by Gangwar (2017), Garrison et al. (2015), and Khayer et al. (2020), CERPI has been found to have a significantly positive effect on the FPC of SMEs. Since the prime focus of CERPI is to reduce overhead costs and boost performance, it is anticipated that the outcome will be a reduction in operating expenses and an increase in productivity (Garrison et al., 2015). According to the findings of this study, SMEs that make effective use of cloud ERP while also integrating it into their business strategy are able to improve inter-unit collaboration on business processes, which in turn leads to increased agility (Wang et al., 2020). Consequently, this results in an improved flow of information and raw and finished materials throughout the supply chain channels (Morell & Ezingeard, 2002). As a direct consequence of this, the firm achieves higher levels of market share and revenue, as well as return on investment and profitability.

This research has found that TMST does not moderate the relationship between CERPI and FPC; hence, H3 was rejected. Though this is a new finding and the main contribution of this study in the cloud ERP and Malaysian SMEs' context, a similar finding is available in the literature in other contexts (Purnomo & Nastiti, 2019). Thus, this study corroborates the proposition of Alsharari et al. (2020) that it would be difficult for top management to be routinely and actively involved in the use of ERP in reality, particularly after implementation. Additionally, this finding suggests that, while top management support is typically required, top management actions can adversely impact overall staff enthusiasm and absorption capacity, resulting in less ERP integration inside an organisation (Ha & Ahn, 2014) and subsequently dampening performance. Thus, an excessive amount of TMST may have no impact or negative impact (Young & Jordan, 2008), and top management should be aware of their boundary in order to maximise the benefits of implementing cloud ERP.

6.2 Theoretical Implications

This study has added some noteworthy contributions to CC diffusion literature. In response to recent scholars' call (Huang & Yasuda, 2016; Young & Jordan, 2008), we have

examined the relevance of a critical success factor (TMST) in the implementation and post-implementation stages of cloud ERP concurrently to provide a deeper understanding about when the TMST is supposed to have a boundary or continue boundlessly. This finding adds to what other studies have found about the independent importance of TMST in the implementation and post-implementation stages, and it gives a more complete picture of the role of TMST in the complete diffusion of cloud ERP.

Secondly, this study has performed the PLSpredict (model's out-of-sample predictive power), which researchers have typically neglected (Hair et al., 2021). PLSpredict is utilised in order to generalise the results beyond the scope of the sample that is presently accessible (Hair et al., 2021). According to the results of PLSpredict, this study offers the generalisability of the findings to the CERPI context and SMEs; thus, this model can be used to assess other technologies.

6.3 Practical Implications

From the practical point of view, this study has provided evidence to SMEs' decision makers that TMS is a very important factor for successful cloud ERP implementation. Hence, top management and owners should offer support in terms of providing resources (human, financial and logistical), leading the change management through communication, motivation, and initiating strategic vision and actions. Otherwise, a lack of TMS can cause cloud ERP implementation to fail (Grandon & Pearson, 2004).

Secondly, implementing cloud-based ERP systems has been shown to improve FPC. Based on the study's conceptualisation of CERPI, it can be suggested that SMEs have the potential to achieve higher FPC if they use cloud ERP intensively in conjunction with other organisational resources and strategically align it with their corporate goals. Furthermore, manufacturing SMEs may be able to improve their FPC by becoming more adaptable through the use of cloud ERP in production planning and control. They can also use cloud ERP to integrate all of the firm's data and processes, allowing for complete supply chain coordination. Finally, because cloud ERP has been designated as a competitive tool (AL-Shboul, 2018), SMEs can use it to boost their competitiveness and, as a result, their FPC.

Finally, one major practical highlight for top managers is that they should not try to be involved in both the implementation and post-implementation phases of cloud ERP. Top management should provide all relevant support for the successful implementation of cloud ERP, and after that, their support should be limited, especially at the usage point. Employees and all organisational members should have less interference from the top management, which could dampen their motivation and absorptive capacity and subsequently have negative implications on the firm performance. Freedom and creativity with the usage of cloud ERP will bolster users' confidence and job performance and, in turn, positively impact the firm's overall performance.

6.4 Limitations and Future Research Directions

Despite the important contributions and implications this study has for both theory and practice; there are some limitations that should be discussed. First, the sample is made up of top management personnel and owners of SMEs, which is appropriate for a strategic-related topic such as CERPI. However, the insight from other stakeholders, such as middle-level managers, operational managers, employees, and cloud ERP service providers, could improve the quality of the collected data. Therefore, future studies should include these other critical respondents in their sample. Secondly, the cross-sectional survey approach was used in this study, which could have hampered the discovery of other findings that could have been revealed through a longitudinal study. Hence, future research should look towards this direction. Lastly, the research model used in this study could be used in other contexts, such as with service SMEs, other innovative technologies like big data analytics, blockchain, and artificial intelligence, and developed countries. Some new insights may be provided through this application.

7. Conclusion

This research examined the relevance of TMST in both the implementation and post-implementation stages of cloud ERP. The findings indicated that TMST positively influences CERPI, which subsequently enhances the FPC of SMEs. Thus, the support from the top management of SMEs, such as resources provision and change management, are underlying mechanisms to achieve successful implementation of cloud ERP. Further, the CERPI success will reduce operating costs and boost return on investment and profit. Additionally, this study found that although TMST is relevant in the implementation stage, it is irrelevant in the post-implementation stage. An indication that TMST beyond the implementation stage is excessive and problematic. Therefore, our study has been able to draw the boundary of TMST in the cloud ERP diffusion. The findings of this study are of theoretical and practical importance to researchers and SME practitioners.

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Short and Long-Run Association between Crude Oil and Cryptocurrency: An Insight of Vector Error Correction Model

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Abstract

It is co-movement or cointegration among asset classes that assist investors in acting as a safeguard in the financial market from a well-diversified portfolio. There are tremendous amounts which are parked in crude oil and cryptocurrency. This paper investigates the short and long-run association of crude oil with cryptocurrency. The proxies of cryptocurrency are Bitcoin, Ethereum and Tether. We collect the monthly observations of these constituent series extending from December 2017 to February 2021. For empirical analysis, we apply the Johansen cointegration test, Vector Error Correction Model (VECM) and Impulse Response Function (IRF) to examine the relationship. Johansen cointegration test is employed to check cointegration when we have more than two variables, and VECM helps to know the short-run dynamic adjustment. The result reveals that there is long-run causality in crude oil derived from Bitcoin, Ethereum and Tether but not short-run causality. It implies to the investors and portfolio managers that they can only diversify their investment in this two-asset class in a short period.

Keywords: *Investment assets class, Crude oil, Cryptocurrency, Disequilibrium, COVID-19, Diversification*

1. Introduction

Cryptocurrency is a digital asset grounded on the idea of distributed ownership. In the era of the digital revolution, virtual currencies emerged as a new phenomenon for investors outside regulated and streamlined financial markets (Ciaian et al., 2018). The cryptocurrency market captivates investors as financial assets (Glaser et al., 2014; Clark et al., 2018; Corbet et al., 2019) for portfolio management. During the outbreak of the pandemic in 2019, the cryptocurrency market plunged after crashing oil prices, and investment in the digital future is a winning strategy (PYMTS.com, 2020). The price of Bitcoin peaked at $7,900 in 2020 after pressure on the oil routes of Saudi Arabia, and the crypto Savy Alliance became impatient (Coindesk, 2020). In the cryptocurrency market, more than 5,357 currencies are traded with a new blockchain technology platform and used by portfolio managers as virtual investment tools to hedge against risk and speculate potential opportunities (Sami & Abdallah, 2020). By offering less transaction cost, the prices of cryptocurrencies are increasing capriciously and fluctuating abruptly more than other currencies (Bouoiyour et al., 2014; Ciaian et al., 2016b). Cryptocurrency has become very attractive for investors and speculators, but price fluctuations are inconsequential for the financial market in the short term (Junpeng et al., 2016). Cryptocurrencies are highly volatile (Briere et al., 2015; Selmi et al., 2018; Chalvatzis, 2019; Baur & Hoang, 2020). Investors benefit from the interrelation between crude oil prices and cryptocurrencies due to the same attributes of inflation and stimulants. Both assets are significant barometers of concerted anticipation for the future global economy (Bunnag, 2016). On the other hand, crude oil is one form of commodity which is traded around the world. It is the primary source of energy production and is composed of hydrocarbons. It is considered a limited resource globally as it cannot be replaced naturally. Generally, crude oil is the most affected commodity from any event, due to which it is considered as one of the most volatile commodities.

The COVID-19 outbreak has dampened the entire world economy and created financial fragility and disastrous consequences destabilising the effect of financial markets. On March 13, 2020, the cryptocurrency market realised the largest weekly drop in Bitcoin (Jareno et al., 2021). Similarly, during this pandemic outbreak, crude oil also moved negatively in April 2020 because of a mismatch in demand and supply. At the same time, investors having the same commodities (crude oil and cryptocurrency) in their portfolio are more prone. Hence, studying the relationship between these two asset classes is imperative and crucial for investors, portfolio managers and policymakers. On this note, it will help to identify the diversification opportunities mitigating the risk. It is co-movement or cointegration among asset classes which assist investors in acting as a safeguard in the financial market, benefiting from a well-diversified portfolio (Sami & Abdallah, 2020). Moreover, keeping the investment goals in the mindset, the intention to invest in the financial or commodity market differs from investor to investor. Few want to hold their investment in the short run, while few want the long run. Therefore, we study the association between these two-assets classes in the short and long run. The previous studies explored the relationship between the price of crude oil with financial and credit interdependence from 2004-2012 by implementing VAR-DCC, MGARCH and VAR. However, we apply different models like Johansen cointegration and VECM.

This study attempts to investigate the cointegration between crude oil and cryptocurrency; the proxies of cryptocurrency are Bitcoin, Ethereum and Tether. We apply the Johansen cointegration and vector error correction model (VECM) to examine the relationship based on monthly observations extending from December 2017 to February 2021. Referring to the result, we find that there is cointegration between these two asset classes. Further, the VECM result indicates that there is long-run causality in crude oil derived from cryptocurrency while there is no short-run causality. This paper contributes to existing studies in threefold: first, this study provides a detailed investigation between crude oil and cryptocurrencies to identify the diversification. Second, the study is different with respect to select observations. Third, we employ Johansen cointegration and VECM to examine the long-run and short-run association.

The remainder of the paper is categorised into four different chapters. Section 2 includes a detailed review of the literature on crude oil, cryptocurrency, and other financial markets. Section 3 provides data and econometric models, while section 4 discusses empirical results. Finally, section 5 highlights the conclusion and policy implications.

2. Literature Review

From past studies of the market, it is observed that investors opt for crude oil to hedge their market risk due to rising commodities from 2004 (Tang & Xiong, 2010). Now, recent studies are turned towards the cryptocurrency launching of Bitcoin (Nakamoto, 2008), and it is applied as a short-term hedge tool in the extreme condition of the market (Bouri et al., 2017). Cryptocurrency is a unique asset possessing

properties of both a standard financial asset and a speculative (Kristoufek, 2015). The Central Bank of a country regulates fiat currency. However, virtual currency depends on macro variable factors like exchange rate, price of crude oil, and demand for other cryptocurrencies in circulation. Recent research manifests that the cryptocurrency market reached a thrust due to a plunge in oil prices and decreased by $ 26.43 billion due to the oil price war. Russia refused to reduce the price by tracking an increase in demand for oil during COVID-19. Hence the big digital coins Bitcoin, Ethereum, XRP and Bitcoin Cash have suffered a great loss (CNBC, 2020). Crude oil and cryptocurrency can be safe hedging assets that depend on the ability to occupy market risk information by reacting promptly with fluctuations in price (Jin et al., 2019). Beneki et al. (2019) examined the interconnection between Bitcoin and Ethereum through BEKK-GARCH. They found the time-varying correlation due to which diversification cannot be possible as volatility of one market may affect another. Ferreira and Pereira (2019) studied the contagion effect among Bitcoin and other major cryptocurrencies by applying the DCCA approach and found that crypto markets are more integrated. At the same time, Ji et al. (2019) investigated return and volatility contagion among six large cryptocurrencies and noticed more negative return linkages than positive returns. Further, Caporale et al. (2015), Shi and Sun (2017), and Cheng et al. (2019) also explored the fluctuation of oil prices and their spillover among developing economies. Bouri et al. (2017) investigated vigorous conditional correlation among Bitcoin, crude oil, gold, world stock indices, commodity indices and the US dollar. Okorie and Lin (2020) studied the cointegration and found the association between the crude oil market and cryptocurrencies such as Ethereum, XRP and Redd coin by employing VAR, MGARCH-GJR-BEKK. The extreme value behaviour of six cryptocurrencies is also investigated by Osterrieder et al. (2017), and demonstrated abnormal statistical properties of all similar virtual currencies are similar in having the same technology. Taker et al. (2020) discovered the relationship between the five cryptocurrencies with crude oil and gold by applying the Johansen cointegration test and VECM. They found that oil prices affect the Tether negatively. Tether also showed unidirectional causality derived from oil prices and Bitcoin. The precariousness in the global economy impressed huge price variability and risk-capricious trends in the global financial and energy market (Li & Wei, 2018; Wei et al., 2017; Zhang & Wang, 2019). While facing inconsistent risk in the financial and energy market, investors opt for a diversified portfolio to offset their market risk and earn profits (Cunado et al., 2018). Crude oil is the barometer of the economy and the most crucial variable of energy and commodity indices in the financial market (Chang, 2018).

Bitcoin consumes high energy than all cryptocurrencies to process verification transactions for recording in the blockchain ledger as required for the whole Netherland due to energy computations (Oilprice.com, 2021). Now, cryptocurrency users have 191 million accounts, and the majority were identified in China, USA and Russia in 2018 (Blandin et al., 2020). This paper examines the relationship between the price of crude oil and select cryptocurrency prices (Bitcoin, Ethereum, Dogecoin and Tether). Bitcoin manages at the same platform (CoinMarket Cap, 2020), Tether leverage Alogoran 2.0 (CicionpprNewwire, 2020) and Ethereum are traded through a 'Smart Contract' specially designed by blockchain technology (Blockchain Council, 2020). The integration between cryptocurrency and blockchain technology shares real-time big data for supporting the secured strategic decision that enhances the profitability of investors (Hassani et al., 2019). It also enhances the risk due to the price dynamics of cryptocurrencies being interdependent on each other. It will not signify a positive correlation (Agosto & Caffereta, 2020). Digital money basically depends on energy, due to which the rise in crude oil prices increases the prices of cryptocurrency. Bitcoin is a dominant currency on digital signatures for electronic transactions without trusted parties (Nakamoto, 2008). All virtual currencies have the same development pattern and strong network effects favoured price disparity (Gandal & Halaburda, 2016). Ciaian et al. (2016) studied the cointegration between exchange rate and Dow Jones Stock indices employing Vector Autoregression and the Vector error correction model. They observed that the exchange rate, the Dow Jones Index and oil price impacts Bitcoin only in the short term. Further, Kamal and Hassan (2022) examined the connectedness between the cryptocurrency environment attention index (ICEA) and clean energy stocks. The study reveals that there is high connectedness among these assets class, due to which diversification is not feasible.

To summarise, we find sufficient literature on co-movement and cointegration among the stock market, commodity market, cryptocurrencies and other asset classes. However, as per the extant literature, very few studies have been found on crude oil and cryptocurrencies. Additionally, at the current juncture, cryptocurrencies and crude oil are the most demanding investment alternatives. Hence, identifying the diversification opportunities and mitigating the risk from these two assets class is imperative for those investors who believe in investing in it; the same motivates us to carry on

this study. Furthermore, the literature draws the attention of investors and portfolio managers who look for portfolio diversification opportunities.

3. Data and Econometric Model

3.1 Data

To investigate the short and long-run association of crude oil with cryptocurrency, we consider Bitcoin, Ethereum and Tether as proxies of cryptocurrency. The monthly data of these constituent series is collected extending from December 2017 to February 2021 using Bloomberg. Both assets are significant barometers of concerted anticipation for the future global economy (Bunnag, 2016). On the other hand, crude oil is one form of commodity which is traded around the world. It is the primary source of energy production and is composed of hydrocarbons. It is considered a limited resource globally as it cannot be replaced naturally. Generally, crude oil is the most affected commodity from any event due to which it is considered as one of the most volatile commodities. Following is the description of the variables considered in this study:

3.2 Econometric Model

The study is based on an adjustment between long-run and short-run equilibrium between the price of crude oil and prices of cryptocurrencies such as Bitcoin, Ethereum, Binance coin, XRP, Litecoin and Tether, and shows the casual relationship among them. First, the prices are modelled through VAR with one lag. It enables us to verify Cross Correlations and Auto Correlations in their prices. Then the time-varying Cointegration is examined through the Johansen Cointegration model. For verifying, Vector Error Correction Model (VECM) is implemented to check the adjustments of short-run dynamics equilibrium. This study commences with a Unit Root test through the Augmented Dickey-Fuller test to check whether the data is stationary or non-stationary. With the help of the Cointegration test, the number of cointegrating vectors and cointegrating equations have been traced among the variables. Next, the Cointegration will be determined to check the long-run equilibrium among variables. Then, the short-run dynamics will be ascertained by applying VECM covering long-run adjustments. Finally, the Impulse Reaction function demonstrates the relationship between the price of Crude Oil and the price of Cryptocurrencies.

3.2.1 Test of Stationarity

To employ cointegration, the series must be integrated in the same order (Yadav et al., 2022). Hence, we must check the stationarity and confirm the same. A series is said to be stationary if its mean and variance is constant. The time series may be stationary or non-stationary, which can be determined by a test of stationarity. In case of stationarity, the variables do not fluctuate with time, but variables may oscillate along with time. There are many tests for checking stationarity; one of them is the Augmented Dickey-Fuller (ADF) test. The unit root is a unique feature of the time series, which construct it non-stationary. It exists in a time series with a value of α=1 in the following equation.

$$Y_t = \propto Y_{t-1} + \beta X_e + \epsilon \quad (1)$$

Where Y_t the value of the time series, X_e is exogenous variable, α=1 is the coefficient of first lag on Y_t.

As we have four variables, the equation may be written as below: -

$$Y_t = c + \beta t + \propto Y_{t-1} + \emptyset_1 Y_{t-1} + \emptyset_2 Y_{t-2} \ldots\ldots + \emptyset_p Y_{t-p} + e_t \quad (2)$$

In equation (2), the null hypothesis presumes the presence of a unit root that is revealed by α =1, and the p-value obtained after applying the test must be lesser than the significance level of 0.05 for the rejection of the null hypothesis (Chaudhary, 2020). If the null hypothesis is not rejected, it proves that the series is non-stationary.

Table 1. Description of the crude oil and cryptocurrency

Variables	Asset	Source
Crude Oil	Crude oil	Bloomberg
Cryptocurrency	Bitcoin	Bloomberg
	Ethereum	Bloomberg
	Tether	Bloomberg

Source: Authors' Construction

3.2.2 Johansen Cointegration and Vector Error Correction Model (VECM)

Johansen's cointegration (1988) test is applied to check the cointegration when we have more than two variables (Yadav et al., 2022). This test determines the presence of cointegrating vectors in the case of non-stationary series. In the case of a higher dimensional system, the Johansen test is applied (Hjalmarsson & Osterholm, 2007). Johansen is the maximum likelihood estimator of a reduced rank model (Sorensen, 2019). This test contains trace statistics and eigenvalue statistics. In this paper, we consider four different variables, which can be presented as below:

$$y_1=(y_{11},y_{12},\ldots\ldots,y_{1t})$$

$$y_1=(y_{21},y_{22},\ldots\ldots,y_{2t})$$

$$y_1=(y_{31},y_{32},\ldots\ldots,y_{3t})$$

$$y_1=(y_{41},y_{42},\ldots\ldots,y_{4t})$$

In a combined way, equation s expressed as: -

$$Yt = \acute{A}_1 y_{t-1} + \acute{A}_2 y_{t-2} \cdots + \acute{A}_p y_{t-p} + \beta X_t + \varepsilon \quad (3)$$

In above equation

Y_t= k vector of non-stationary variables

X_t= Vector of deterministic variable

$$\Delta Y_t = \Pi Z_{t-1} + \sum_{i=1}^{p=1} \Pi \Delta yt - 1 + \beta X_t + \in \quad (4)$$

$$Where\ \Pi = \sum_{i=1}^{p=1} At - 1$$

$$\Pi = \sum_{j=i+1}^{p=1} At - 1$$

where, Π = information on coefficient Matrix between levels of series, Π = decomposed as $=\alpha\beta^{1}$, α matrix = adjustment coefficients and b matrix= Co integration Vectors.

After confirming the relationship among variables, we apply a further Vector Error Correction Model (VECM) to check the short-run dynamic adjustment. VECM is restricted Vector autoregression (VAR) containing cointegrating restrictions due to which it is applied on non-stationary series. It is very significant in time series; it gives information about long-run dynamics. In this model, the long-run effect will be shown by exogenous variables. It also defines short-run adjustment when variables are out of equilibrium (Erica, 2021).

$$\Delta Y_t = \Phi D_t + \Pi Y_{t-1} + T_1 \Delta Y_{t-1} \ldots\ldots\ldots T_{p-1} \Delta Y_{t-p+1} + \in_t \quad (5)$$

Π= reveals the Effect of the Long Run matrix through $\Pi + \Pi_1 + \Pi_2 + \Pi_3 \ldots\ldots + \Pi_p$

T_k= expresses the Effect of the Short Run matrix from $\sum_i^p = k + 1\, \Pi_j$ & defines short-run variations from equilibrium, D_t= Deterministic terms where μ_1 signifies trend component & $\mu_0$is constant.

4. Results and Discussion

We report the result and discussion starting from the summary statistics. Table 2 encapsulates the summary statistics of crude oil, Bitcoin, Ethereum and Tether. It is observed that the mean of Bitcoin is the highest (10614), and Dogecoin (0.42199) is the lowest. The volatility is depicted by standard deviation, which is high in the case of Ethereum compared to the rest of the variables. The price of crude oil is skewed negatively, which indicates the chances of negative prices, while all cryptocurrencies like Bitcoin, Ethereum and Tether have positive skewness. Each constituent series in this study is not normally distributed, so it strongly rejects the null hypothesis (series follows normal distribution) at a 5% significance level. The skewness and kurtosis value of the constituent series has confirmed the same.

Table 2. Summary statistics of constituent variables

Statistics	Crude oil	Bitcoin	Ethereum	Tether
Mean	57.11	10614	388.07	1.00
Minimum	21.04	3437.2	106.71	0.98
Maximum	76.73	45164	1418.80	1.02
Standard Deviation	13.23	13.234	8212.50	0.00
Skewness	-0.83	2.7591	1.72	0.87
Kurtosis	0.10	7.7732	2.33	3.41
Jarque-Bera Test	4.51	147.67	28.18	23.90
Probability	0.0047	0.0000	0.0000	0.0000

Source: Author's own presentation

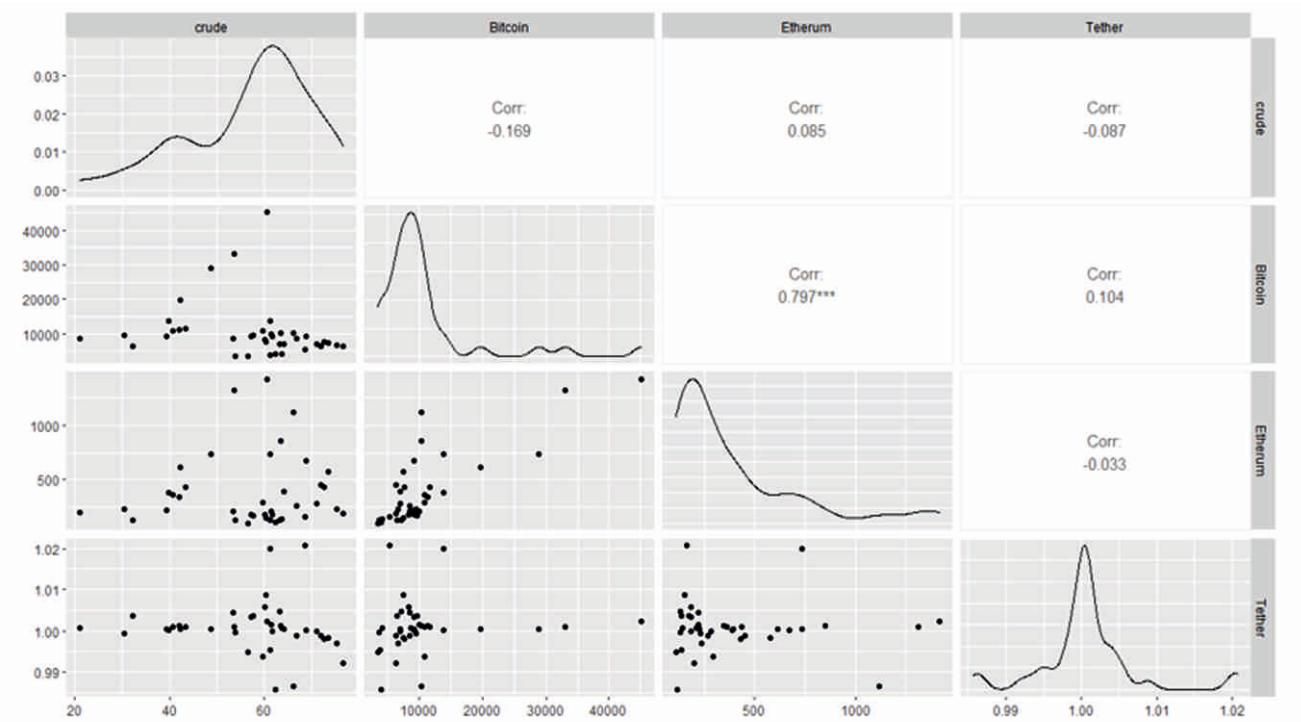

Figure 1. Correlation and overall distribution pattern of constituent series

Figure 1 displays the correlation and distribution of the pattern of constituent series, as it is seen that no series is normally distributed, which has been confirmed by the Jarque-Bera test. Further, Bitcoin and Ether have a high correlation (0.797), while Ethereum and Tether have a low correlation (-0.033). There is a high correlation between Bitcoin and Ether because the ratio of the annual creation of Ether to Bitcoin follows the Ether-Bitcoin (ETHBTC) exchange rate.

Table 3. Result of ADF Test and PP Test for Unit Root

Variables	Augmented Dickey-Fuller Test				Phillips- Perron Test				Inference on Integration
	Levels		First Difference		Levels		First Difference		
Crude oil	-2.1075	0.5313	-3.5818	0.04	-13.143	0.2966	-27.378	0.01	I (1)
Bitcoin	-1.9101	0.6086	-4.4793	0.01	-10.528	0.4634	-27.378	0.01	I (1)
Etherum	-1.4329	0.7955	-6.2269	0.01	-7.3819	0.6642	-41.502	0.01	I (1)
Tether	_1.9979	0.5742	_3.5395	0.05	_39.829	0.21	_42.337	0.01	I (1)

Source: Author's own presentation

Next, we apply the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to check the stationarity of the series, which is presented in Table 3. The null hypothesis for these two tests is the series is non-stationary or the series has the presence of a unit root. Referring to the results of the ADF and PP test, we notice that the constituent series have a presence of unit root at level as their p-value is greater than 0.05. However, the p-value is less than 0.05 in the case of the first difference of the series. Hence, each series is integrated at first difference. After confirming the integration of each variable in the same order, we employ the Johansen cointegration test to examine the cointegration.

Figure 2 exhibits the graphical representation of Crude oil, Bitcoin, Ethereum and Tether. We observe that Bitcoin and Ethereum are co-moving while Crude oil and Tether do not co-move. Further, their cointegration test decides whether they co-move or not. For this analysis, we apply the Johansen cointegration (1988) test, which is presented in Table 4. Since there are four variables, there may be a possibility of g–1 cointegrating equations. The results of the Johansen cointegration tests are based on the trace test (λ_{trace}) and maximal eigenvalue (λ_{max}). Referring to the table for the trace statistics, its value (192.15) is greater than its critical value (76.06), which strongly rejects the null hypothesis (r=0 or no cointegration among variables). Therefore, we infer that there is cointegration among Crude oil, Bitcoin, Ethereum and Tether. As regards maximal eigenvalue statistics, its value (137.39) is greater than its critical value (34.40), which suggests that there is cointegration. The result of trace statistics and maximum eigenvalue statistics is in a similar line. On this note, it can be said that the evidence supports long-run association among constituent series. Therefore, there might be a probability of the existence of temporal causality at least in one direction among the constituent series if variables are found to be cointegrated (Miller, 1991). Further, the VECM is applied to test short-run dynamic adjustment.

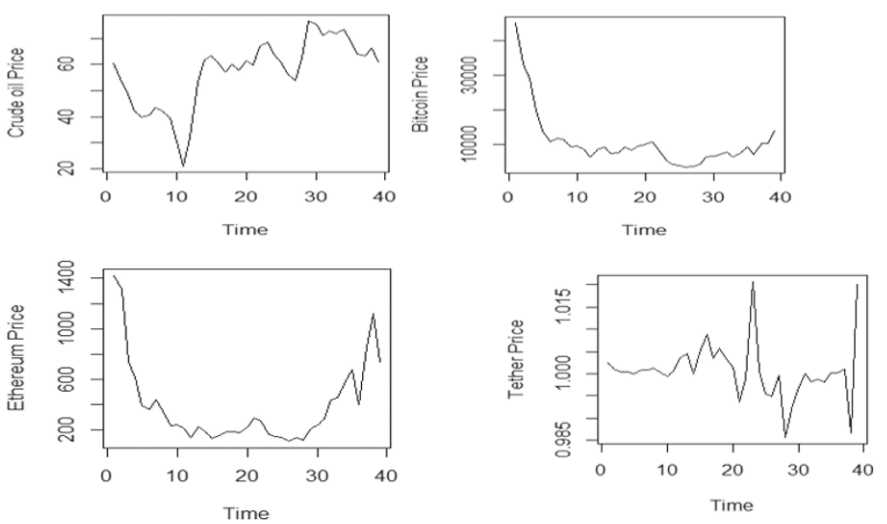

Figure 2. Graphical Representation of Constituent Series

Next, we report the result derived from the vector error correction model (VECM) in Table 5. It provides the coefficients and the standard error of the estimate. As VECM is applied on stationary series, we convert the raw series in the first difference. In this paper, Dcrude is our target variable which will derive the long-run and short-run causality from Dbitcoin, Detherum and Dtether. To apply VECM, we require optimal lag, which is 3 as per Akaike Information Criteria (AIC). Referring to Table 5, the VEC long-run causality or error correction term is -0.092 and significant, which indicates 9.2% disequilibrium will be corrected each month in the short run. So, there is evidence for long-run equilibrium between crude and constituent variables. The short causality is depicted in the standard error of estimate with sign (**). We observe that there is short-run causality in crude derived from Detherum and Dtether at lag 2 only; therefore, it can be said that there is no short-run causality.

Table 4. Result of Johansen Cointegration Test

Trace Test Statistics (λ_{trace})		
No. of cointegrating equations	Trace Statistics	Critical values
r = 0	192.15	76.07
r <= 1	54.76	53.12
r <= 2	32.12	34.91
r <= 3	14.44	19.96
Maximal Eigenvalue Statistics (λ_{max})		
No. of cointegrating equations	Eigenvalues	Critical values
r = 0	137.39	34.40
r <= 1	22.64	28.14
r <= 2	17.69	22.00
r <= 3	11.48	15.67

Table 5. Result of Vector Error Correction Model (VECM)

VEC Long Run Causality Error Correction Term	**Dependent Variable**	
	Coefficients	**Standard Error of Estimates**
	-0.092	(0.3041)**
Independent Variables		
dCrude (-1)	0.5075	(0.2658)
dCrude (-2)	0.0356-	(0.2573)
dCrude (-3)	0.2715-	(0.2646)
dBitcoin (-1)	-0.0026	(0.0013)
dBitcoin (-2)	0.0024	(0.0012)
dBitcoin (-3)	0.0003	(0.0007)
dEthereum (-1)	0.0411	(0.0239)
dEthereum (-2)	0.0575	(0.0253)*
dEthereum (-3)	0.0207	(0.0250)
dTether (-1)	3677.8616	(1711.5091)*
dTether (-2)	16.1188	(453.3921)
dTether (-3)	406.5779	(520.3727)

Source: Author's own presentation

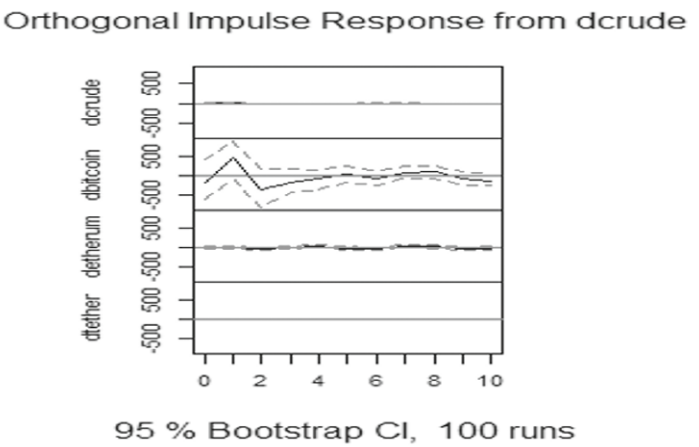

Figure 3. Impulse Response Function of Dcrude to Cryptocurrency

Further, the impulse response function (IRF) supports exploring the changes in one variable due to the shock in another variable. It establishes the direction, magnitude and reaction of the variable in future. Figure 3 illustrates the result of IRF of the price of crude oil to the price of selected cryptocurrencies. Considering the one-unit standard deviation shock of dcrude to dcrude itself, there is less fluctuation in dcrude. The dcrude is being deviated from period 1 to 10, and fluctuations are observed at minimum. On the other hand, dbitcoin oscillates at a high pace with smaller changes in dcrude till period 5 with negative changes and it continues with up and down in the remaining period. Further, due to shocks in dcrude and dbitcoin, the negative changes are witnessed in detherum till period 3, with a slight upward move in period 4 and again negative shocks are illustrated from period 4 to 6, and upward movement has been started again. Moreover, shocks are not perceived in dtether from period 0 to 10.

5. Conclusion and Policy Implication

Due to the COVID-19 outbreak, the economy of the entire world has been dampened and backed by financial fragility and disastrous consequences. At the same time, the cryptocurrency market realised the largest weekly drop in Bitcoin (Jareno et al., 2021). Similarly, during this pandemic outbreak, crude oil also moved negatively in April 2020 because of a mismatch in demand and supply. These scenarios created an alarming issue for the investors having the same commodities (crude oil and cryptocurrency) in their portfolio. Therefore, examining the relationship between crude oil and cryptocurrency is necessary.

We examine the short and long-run association between crude oil and cryptocurrency. We consider Bitcoin, Ethereum and Tether as proxies to measure the cryptocurrency. Collecting the monthly observations from Blomberg extending from December 2017 to February 2021, we employ the Johansen cointegration test, Vector error correction model (VECM) and impulse response function (IRF). Regarding the Johansen cointegration test (Trace and Eigen statistics), we find that there is cointegration between crude oil and cryptocurrency. Further, VECM indicates a long-run causality in crude oil derived from Bitcoin, Ethereum and Tether but not a short-run causality. This study is in a similar line to Jareno et al. (2021). The findings of this paper offer an implication for investors and portfolio managers. The intention to invest in the financial market or commodity market differs from investor to investor. Few want to hold their investment in the short run, while few want the long run. Therefore, this study suggests that investors and portfolio managers should diversify their investment in these two-assets classes in a short period only to mitigate the risk as these asset classes are cointegrated in the long run only. Further, the disequilibrium in crude oil from cryptocurrency can not be derived as there is no causality in the short run.

Like other studies, it is also not left with limitations. This paper is in a similar line with Beneki et al. (2019), Taker et al. (2020), and Jareno et al. (2021) as they consider cryptocurrencies. We use monthly data, which can be studied by further considering daily observations. To examine the association, the Johansen cointegration test is applied, which can be extended in the form of dynamic conditional correlation, cross wavelet transforms (XWT), and wavelet coherence (WC) to investigate the dynamic connectedness and linkages among these asset classes.

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Does Entrepreneur's Self-Compassion Improve the Family-Owned Small Business's Performance?

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Abstract

The present study intends to investigate the influence of entrepreneurs' self-compassion (i.e., self-judgment, self-isolation, and mindfulness) on family-owned small business (F-OSB) performance during the pandemic.

A conceptual model with self-judgment, self-isolation, mindfulness (formative constructs), and F-OSB performance (reflective construct) was based on three hypotheses. Primary data (n=227) was collected from entrepreneurs designated as CEO, Chairman, or managing directors in F-OSBs in Pakistan. The study used Partial Least Square Structural Equation Modelling (PLS-SEM) through Smart-PLS software version 3.3.2. First, the reliability and validity of the constructs were tested. In the next step bootstrapping to test the hypothesis was implemented. Self-control theory is used to explain the conceptual model.

Results revealed that self-judgment and self-isolation have a significant negative while mindfulness has a significant positive association with F-OSB performance.

The research contributed to literature and theory and has a post-pandemic practical contribution. First, the study filled a research gap by investigating the relationship between self-compassion and F-OSB performance. Second, this study contributed to the self-control theory by explaining the aforementioned relationship in the F-OSB context. Third, the results implied that, along with vaccination and financial support by the governments, F-OSB entrepreneurs must be provided psychological training sessions to cope with the negative effects of self-judgment and self-isolation due to lockdowns. Thus, F-OSB entrepreneurs not only perform well after COVID and become psychologically strong to take vigilant and calculated initiative for their businesses' and families' betterment.

Keywords*: Self-compassion, family-owned small business, Covid-19, Performance, Smart-PLS, Stress*

1. Introduction

COVID-19 is a hindrance to the entrepreneur's cognitive approach and sentiments. Similarly, it poses a serious threat to business performance (Cacciotti & Hayton, 2015; Cacciotti et al., 2016; Kollmann et al., 2017). Economic statistics of countries indicate a declining trend in the performance of businesses, particularly family-owned small businesses (F-OSB) (Ahmad & Yaseen, 2018; Park & Choi, 2020). Fear of loss or F-OSB's closure shapes entrepreneurial activities (Lebel, 2017; Murnieks et al., 2020). So, it is essential to understand which factors allow entrepreneurs to successfully manage their business performance by minimising the stress and unpleasant facets arising from COVID-19. Managing the actual performance of the F-OSB has received a lot of attention in the entrepreneurial literature (Goni et al., 2021; Williams Jr, 2018; Zin & Ibrahim, 2020). However, research on managing the day-to-day challenges due to the pandemic has provoked entrepreneurs' concern about low business performance, which is remarkably scarce.

Pakistan's small and medium-sized enterprises (SMEs) are the country's economic backbone (Ahmad et al., 2018). A recent survey of Pakistan's SMEs revealed that they contribute 40%, 25%, and 60% to the country's GDP, exports, and employment, respectively (Hassan, 2020). SMEs account for 90 % of all businesses in Pakistan (Khan, 2020). Indeed, there are 3.3 million business units in Pakistan's four provinces (i.e., Punjab, Sindh, Khaybar Pakhtunkhwa, and Baluchistan) (Khalique et al., 2015). A claim proposed by Belansteguigoitia Rius (2013) disclosed that 90% of the world's businesses among SMEs are family-owned businesses. Research in the F-OSB context is a rapidly expanding and highly competitive field of study in this era. Furthermore, the present COVID-19 epidemic has made this subject of research even more vital to explore since an increasing number of F-OSB entrepreneurs are coping with the pandemic's consequences. An international firm Klynveld Peat Marwick Goerdeler (KPMG), surveyed the influence of COVID-19 on F-OSBs and revealed that F-OSBs dropped 69% of their revenues, slumped 8.56% employment, reduced the employee working hours significantly, and 14% temporarily or permanently close down their businesses (De Massis & Rondi, 2020). Thus, this pandemic phase emerged a sense of deprivation and frustration among entrepreneurs as they could not achieve their F-OSB's performance targets and set goals.

Entrepreneurs have high attachment and recognition with their F-OSBs (Belchior & Lyons, 2021). Entrepreneurs pass through the highs and lows of the business life cycle and enrich their decisions with experience (Charoenrat & Harvie, 2017; Khefacha & Belkacem, 2015). However, entrepreneurs' decision enrichment which makes them either prosperous or not, is based on their self-compassion attributes (Neff et al., 2018). Self-compassion may thrive either way; inwards (i.e., self-understanding, acceptance and self-love) or outwards (i.e., affection towards relations and material things like business) (Boellinghaus et al., 2014). F-OSB entrepreneurs who have inward compassion are most likely to think of their own mental and physical health (Boellinghaus et al., 2014). Thus, they prioritize themselves and decide to quit the business, which results in the F-OSB's close down. Contrarily, F-OSB's entrepreneurs having compassion outward, are more concerned about their business performance even in an economic downturn. In addition, F-OSB entrepreneurs are more concerned with maintaining their control (Berrone et al., 2014), socio-emotional wealth (Le Breton-Miller & Miller, 2014), and business performance across generations (i.e., outward compassion). However, failing to preserve the business performance and opportunities could have negative effects (Gómez-Mejía et al., 2007) and enhance the entrepreneur's frustration. Thus, a need arises to investigate self-compassion's influence on F-OSB's performance during the pandemic. This study aims to examine the influence of self-compassion on F-OSB performance during the pandemic. The researchers chose three highly predicting dimensions of self-compassion (i.e., self-judgment, self-isolation and mindfulness) and explained them through socio-emotional wealth theory. The study filled a research gap by investigating the research question, Does self-compassion contribute to enhancing F-OSB performance? The results are helpful for the members of F-OSBs and urge the policymakers to introduce entrepreneurs' psychological well-being programs nationwide. This study advises the family members to provide physical or psychological support to their sibling or successor who is handling their F-OSB.

2. Literature Review and Hypothesis Development

2.1 Self-Compassion

Self-compassion is an individual's warmth and understanding toward his self when he suffers, fails or feels inadequate, rather than ignoring his pain or flagellating his self with self-criticism. Self-compassionate entrepreneurs recognize that being imperfect, failing, and experiencing difficulties are inevitable, so they tend to be gentle or critical of themselves when confronted with business losses. Being

gentle means acceptance of failure with a looser feeling, and critical means feeling pain and never accepting failure. Both states of self-compassion may harm the F-OSB's performance. Self-compassion is composed of three important factors; self-judgment, self-isolation, and mindfulness, which represent an entrepreneur's traits. So, this study intends to investigate the effect of; self-judgment, self-isolation, and mindfulness on F-OSB's performance.

2.2 Self-judgment

Judgment is an individual's ability to utilize personal qualities with relevant knowledge and experience to form opinions and make decisions (Likierman, 2020). An individual's judgment relies on his self-judgment. Self-judgement is thoughts that individuals have about themselves and various meanings attached to those thoughts. However, these thoughts can be negative or positive (Dyer, 2018), which are linked to the frequency of occurrence of the annoying or pleasing event (Phaedonos & Anastassiou-Hadjicharalambous, 2011). Successful individuals are less self-judgmental and may have strong control over their thoughts and feeling. They preserve their self-respect and are less prone to unhelpful thoughts. On the other hand, an individual confronting a high frequency of failure becomes more self-judgemental. They have more negative and destructive thoughts. The founding researcher Neff (2003) supported that less self-judgemental individuals are more realistic about their monetary and non-monetary gains. On the contrary, highly self-judgemental individuals greatly exacerbate their suffering and feel themselves as losers (Braehler & Neff, 2020). Such high self-judgemental feelings hurt their well-being (Scott-Jackson & Mayo, 2018) and performance (van Leijden, 2020). Autonomous and independent actions are important entrepreneurial characteristics (Rauch & Frese, 2000). Self-judgement of entrepreneurs enables them to perceive the future market and resource availability (Mutingi & Chakraborty, 2021; Rothbard, 2009) and exploit opportunities to enhance the firm's progressive values (Won, 2015). Thus, self-judgment may result in the high performance of F-OSB. The proposed hypothesis is:

H1: Entrepreneur's self-judgment contribute to enhancing family-owned small business performance.

2.3 Self-Isolation

Self-isolation is an individual's disinterest in his partners, peers, subordinates, friends, family members, and other stakeholders from the work set. Self-isolation directly affects the individual's productivity in general (Saleh et al., 2018) and the entrepreneur's capabilities specifically (Contreras-Barraza et al., 2021). Self-isolation is perceived to harm the entrepreneur's capabilities due to the high stress (Fernet et al., 2016). Stress-appraisal theory (Lazarus & Folkman, 1984) conceptualizes that social support prevents entrepreneur's from work overload stress and role conflicts because of strong social ties (Kariv, 2008). The researcher Thorburn (2000) indicated that broken family relationships and societal isolation cause isolation. Cardon et al. (2009) revealed that an entrepreneur's loneliness leads to business failure. However, Cope (2011) further highlighted that self-isolation diminishes the individual's capability to identify opportunities. In addition, an individual's self-isolation damages the procedures and protocols and lowers the team's performance outcomes (Hamrouni & Ben Salem, 2013). Likewise, a salesman working in a company who has isolated him/herself has a significant negative association with organizational commitment and job performance (Mulki et al., 2008). More interestingly, Morales and Rahe (2009) argue that females who are lower in number in a firm feel a greater sense of social isolation and intense performance pressure (Morales & Rahe, 2009). It results in lower satisfaction and, subsequently, low performance. Haynes et al. (2020) investigated the co-perineurial business owners and revealed a strong relationship between the two entrepreneurs results in high profitability. So, an entrepreneur's self-isolation may affect F-OSB's performance negatively. The proposed hypothesis is:

H2: Entrepreneur's self-isolation contributes negatively to the family-owned small business's performance.

2.4 Mindfulness

Mindfulness is a unique concept that helps people improve their judgmental abilities and perform better in tough situations (Gärtner, 2013; Zhang et al., 2013). Gärtner (2013) defined mindfulness as "a state of consciousness when people focus on what is happening in actual- adjust the focus and update their knowledge- and reflect reality accurately". In addition, Hofmann et al. (2010) defined it as "a mental condition described by a non-judgmental understanding of one's present-moment experience, encompassing feelings, thoughts, physical states, consciousness, and surroundings fostering tolerance, interest, and acceptance". The idea of mindfulness, which derives from Buddhist spiritual teachings (Hirst, 2003), has been utilized in clinical research (Grossman et al., 2004; Janssen et al., 2018), psychology (Feldman & Kuyken, 2019; Greenberg et al., 2012; Hofmann et al., 2010), and management (Glomb et al., 2011; Taylor & Bishop, 2019).

However, a prior study has indicated a connection between mindfulness and improved performance in various disciplines (Charoensukmongkol, 2019; Zhang et al., 2013). Researchers have recently used mindfulness in business management to study the benefits of mindfulness in decision-making and workplace performance (Leroy et al., 2013; Van Gordon et al., 2015). However, the use of mindfulness in the sphere of entrepreneurship is still a relatively new topic of research. Mindfulness positively influences the performance outcome (Dane & Brummel, 2014; Glomb et al., 2011; Good et al., 2016; Sutcliffe et al., 2016) through knowledge sharing, interpersonal relationships, and decision-making information (Gupta, 2017; Malinowski & Lim, 2015; Sauer & Kohls, 2011). Roche et al. (2014) and Haar et al. (2014) revealed that mindfulness positively enhances the leader's psychological well-being, which results in more effective performance. Mindful individuals are highly stress-tolerant (Hülsheger et al., 2013). Thus they attain slow brain wave activity, which results in high creativity and problem-solving (King & Badham, 2020). A creative cognitive style improves innovativeness, organisational learning (Levinthal & Rerup, 2006), and performance (King & Haar, 2017). Thus the proposed hypothesis is:

H3: Mindfulness has a significant positive association with family-owned small business performance.

3. Theoretical Framework

Self-compassion is a useful instrument for examining the psychological functioning of individuals in general and entrepreneurs in specific. The present study involved the three high-predicting dimensions (i.e., self-judgment, isolation, mindfulness) of self-compassion, as researchers can use positive and negative dimensional combinations (Neff, 2003; Sousa et al., 2017). This study supports the model using the self-control theory (Kotabe & Hofmann, 2015). Self-control theory states that self-control serves as an executive function necessary for individual goal attainment. It is a cognitive process for self-regulating behaviour in pursuit of personal goals. Effective self-control has been linked to success in occupations, either job to business success (Ahmad et al., 2022). This advanced executive process allows us to inhibit ourselves from impulsive responses in behaviour. Desire-goal conflict, control capacity, and higher-order goals are components of self-control theory. A desire-goals conflict leads an individual towards self-judgment when the desire to achieve goals becomes at least partially or fully incompatible with higher-order goals like high profitability and performance of the business. Control efforts are effective in controlling non-motivational cognitive resources to control desires. Control desires increase and lead to self-isolation when the entrepreneurs do not find the desired potential to achieve business goals. However, a higher-order goal is a largely cognitive construct associated with an endorsed end state that motivates one to achieve performance through cognitive activities (mindfulness). Persuasion of goals by means of mindfulness/ cognitive anticipation is associated with the declarative expectation of long-term benefits for the business.

4. Method

4.1 Sample and Data Collection

This study targeted a developing country, Pakistan, to collect the primary data using a cross-sectional approach. Pakistan's entrepreneurs cope with declining business performance and, subsequently, psychological pressure due to the prevalence of COVID-19 and the unavailability of the business support package from public and private institutions. Thus, target respondents in Pakistan may provide the true influence of self-compassion on F-OSB performance. F-OSBs were tracked through the available list at the Pakistan Chamber of Commerce in five major districts: Lahore, Faisalabad, Sialkot, Gujranwala, and Multan. The researchers considered a few conditions to filter out the exact F-OSBs: 1) F-OSB prevailing for more than five years, 2) two or more family members controlling the business, and 3) the number of employees not more than 200. The CEO, Chairman, or managing directors of F-OSB were approached through available phone numbers. A list of 352 participants was finalized based on their volunteer participation intention. Participants were contacted according to their set appointment date and time. The researchers received 295 questionnaires. However, 227 questionnaires were finalized, and 68 were excluded after scrutiny (i.e., exclusion was based on incomplete and inconsistent responses). The personal information of participants revealed that 88% of the participants were male, and 73% were middle-aged (i.e., between 40-60 years old). At the same time, 69% belonged to the second, 23% to the third and 8% to the fourth generation. This study used PLS-SEM by using Smart-PLS software for data analysis. The second-generation software was used because the model of this study consisted of formative and reflective constructs. Moreover, this software has the capability to predict more reliable and valid results despite the small sample size of this study (Sarstedt & Cheah, 2019).

4.2 Measures

Each of the three components- self-judgment, self-isolation, and mindfulness had three items. This scale was recently validated by Neff (2016). It was measured on a five-point Likert scale ranging from 'Not at all true for me' to 'Very true for me'. Three self-judgement items are as follows; 1) I'm pretty tough on myself, 2) I'm a bit cold-hearted towards myself, and 3) I feel intolerant and impatient toward myself. The isolation items are; 1) I feel separate and cut off from the rest of the world, 2) I feel like I'm struggling more than others right now, and 3) I'm feeling all alone right now. The mindfulness items are; 1) I'm keeping my emotions in a balanced perspective, 2) I'm taking a balanced view of this painful situation, and 3) I'm keeping things in perspective.

Family-owned business performance: Dependent variable 'family-owned business performance' consisted of twelve elements. This scale was used for the first time by Sreih et al. (2019) in the family business context. It was quantified using a five-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. The elements of this scale are as follows; 1) Satisfaction with team management decision style, 2) Facing the occurrence of conflict and disagreements, 3) Satisfaction in the formulation of specific succession plans, 4) Usage of outside advisor services, 5) time spent in strategic planning, 6) use sophisticated financial management methods, 7) influence of original founder, 8) consider going public, 9) satisfaction with top management style 10) Satisfaction with business profitability, 11) Satisfaction with rapid growth achievement, 12) business has met my expectations.

4.3 Data Analysis Technique

The initial step in this quantitative analysis was to assess the questionnaire's reliability and validity. Second, an algorithm and bootstrapping was implemented to determine the effect of exogenous variables on endogenous variables. The primary data were analysed using smart PLS 3.3. In this study, exogenous constructs were treated as reflective and endogenous constructs were formative measures. So, researchers addressed their reliability and validity with due diligence.

4.3.1 Reliability and Validity

a) Exogenous Constructs

The Cronbach's alpha values of each exogenous construct (i.e., self-judgement, self-isolation, mindfulness) were approximately 0.7 as prescribed by Hair et al. (1998) and AVE (average variance extracted) exceeding 0.5 (Hair et al., 2012). Likewise, the factor loading of each reflective construct is higher than 0.5 and the significance level ($p<0.000$) (Hair Jr et al., 2017). It guarantees the communality of each indicator, having obtained AVE values higher than 0.5. It is guaranteed that each scale used in this study has convergent validity (Hair Jr et al., 2017).

Table 1 Exogenous Construct's Reliability & Validity

		Convergent Validity				Internal consistency	Reliability
		Outer loading	Indicator reliability	t-value	AVE	Composite reliability	Cronbach's α
Constructs	Indicators	>0.7	>0.5	>2.	>0.5	>0.7	>0.7
Self-Judgement	SJ1	0.806	0.000	24.533	0.696	0.873	0.781
	SJ2	0.889	0.000	46.472			
	SJ3	0.805	0.000	27.477			
Self-Isolation	SI1	0.907	0.000	10.314	0.583	0.802	0.649
	SI2	0.762	0.000	8.296			
	SI3	0.586	0.000	4.866			
Mindfulness	MF1	0.874	0.000	42.827	0.652	0.848	0.742
	MF2	0.763	0.000	15.777			
	MF3	0.781	0.000	20.168			

Source: Author's own calculation

b) Endogenous construct

This study used a nomological approach to decide the F-OSB performance construct as a formative construct (Finn & Wang, 2014). The convergent validity of this construct as the redundancy analysis value is above 0.7 (Hair Jr et al., 2017). There exists no multicollinearity issue because the VIF value of each indicator is under 5 (Hair Jr et al., 2017). The outer weight values of some of the elements are not significant, so their absolute contribution was analysed through outer loading, and the value of each element was higher than 0.5 and statistically significant (Hair Jr et al., 2017).

c) Discriminant Validity

Calculation of discriminant validity was performed through Fornell–Larcker criterion. Furthermore, the Fornell–Larcker criteria were computed using the square root of each variable's AVE, whose values indicate the diagonal. However, Fornell and Larcker (1981) explained that these values are higher than their corresponding correlations with any other construct. Thus, the reliability and validity test values indicate that data can be used to estimate the hypothesis testing with PLS-SEM.

Table 2. Endogenous Construct's Reliability and Validity

		Significance and outer weight				**Collinearity**	**Convergent Validity**
			t-value	Outer loading	t-value	VIF	Redundancy Analysis
	Indicators	Outer Weight	>1.96	>0.5	>1.96	<5	>0.7
Family_owned small business performance	1	0.295	3.117	0.473	6.089	1.817	0.760
	2	-0.499	4.021	0.275	2.936	2.066	
	3	0.220	2.058	0.593	8.207	2.404	
	4	0.485	1.907	0.866	15.205	3.924	
	5	-0.126	0.760	0.679	10.744	3.888	
	6	0.153	1.032	0.748	13.599	4.226	
	7	-0.084	0.565	0.711	10.056	4.257	
	8	-0.229	1.367	0.592	6.649	2.997	
	9	0.707	3.614	0.840	15.455	4.728	
	10	0.039	0.295	0.513	4.693	1.868	

Source: Author's own calculation

Table 3. Discriminant Validity

Constructs	**Family-owned Small Business Performance**	**Mindfulness**	**Self-Isolation**	**Self-Judgement**
	AVE=NA	AVE=0.652	AVE=0.583	AVE=0.696
Family-owned small business Performance	Formative Model			
Mindfulness	0.577	0.807		
Self-Isolation	-0.339	-0.480	0.763	
Self-judgement	*0.426*	*0.868*	*-0.601*	*0.834*

Source: Author's own calculation

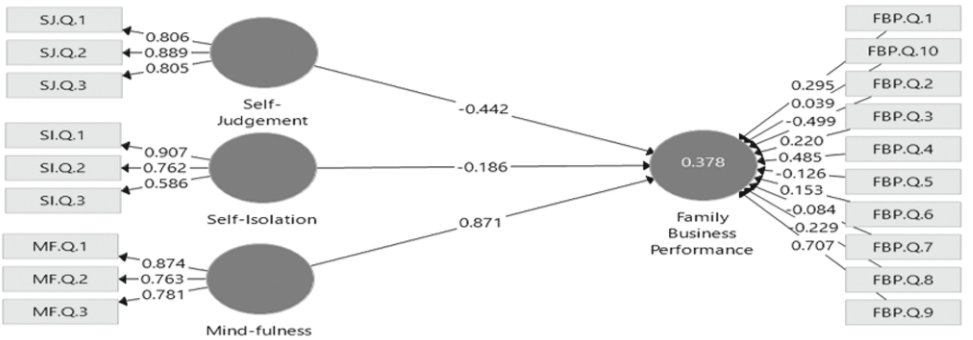

Figure 2. Structural Model

Table 4. Path Analysis

Hypothesis	Path	Co-efficient	t-values	Supported
(H1)	Self-judgement →F-OSB Performance	-0.442	2.241	Accepted
(H2)	Self-Isolation → F-OSB Performance	-0.186	1.910	Accepted
(H3)	Mindfulness → F-OSB Performance	0.871	8.011	Accepted

4.3.2 Hypothesis Testing

PLS-SEM was used to investigate the unaddressed relationship between self-judgment, self-isolation, mindfulness and F-OSB performance. The self-judgement result ($\beta = -0.442$, $t = 2.241$, $p < 0.025$) indicates a significant negative relationship with F-OSB performance. Thus, hypothesis (H1): Entrepreneur's self-judgment contributes to enhancing F-OSB performance is accepted. The self-isolation ($\beta = -0.186$, $t = 1.910$, $p < 0.053$) indicates a significant negative association with F-OSB performance. Thus, the hypothesis (H2): Entrepreneur's self-isolation negatively impacts F-OSB performance is accepted. The mindfulness ($\beta = 0.871$, $t = 8.011$, $p < 0.000$) indicates a significant positive relationship with F-OSB performance. Thus the hypothesis (H3): Mindfulness has a significant positive association with F-OSB performance is accepted. Decisively, self-judgment, self-isolation, and mindfulness have a significant association with F-OSB performance.

5. Discussion

This study investigated the neglected association of important components of self-compassion (i.e., self-judgment, self-isolation, and mindfulness) on F-OSB performance.

A significant negative relationship between entrepreneurs' self-judgment and F-OSB performance reveals that entrepreneurs being high self-judgemental, are more prejudiced about their performance. The results of this study are aligned with Braehler & Neff (2020) and van Leiden (2020). Braehler and Neff (2020) revealed that highly self-judgemental individuals greatly exacerbate their suffering and feel themselves losers. Such a situation hurts their performance (van Leijden, 2020). The results reveal that failure due to complex situations like COVID makes the F-OSB's entrepreneurs highly self-judgemental. They are less reliant on their own decision accuracy. High self-judgemental entrepreneurs start assuming that misjudgement may be more harmful to their F-OSB's performance. Contrarily, less self-judgemental entrepreneurs have a high judgment towards business affairs. They are intensely judgemental towards their F-OSB's progress, competitors, and stakeholders. They rationalize the customer's future demands and evolving marketing trends and develop strategies for competitive advantage, which result in elevated FOSB's performance. Thus, entrepreneurs turning to high self-judgemental may not be able to perform well in their F-OSBs.

A significant negative relationship between entrepreneurs' self-isolation and F-OSB performance reveals that

entrepreneurs passing through a self-isolation situation cut themselves off from their competitors, causing fatal emerging financial and non-financial issues. The results of this study are aligned with Cardon et al. (2009) and Hamrouni & Ben Salem (2013). Cardon et al. (2009) revealed that entrepreneur's pushing themselves to isolation results in business failure. In addition, Hamrouni and Ben Salem (2013) pointed out that an individual's self-isolation damages the procedures and protocols and lowers the team's performance outcomes. Entrepreneurs passing through the self-isolation phase assume that everyone in their social circle is well aware of their failure. They suppose that stories of their business failure have hurt F-OSB's image and legacy and raise a question mark on their capabilities. As a result, they start avoiding social interaction, which results in the declining performance of their F-OSB. Contrarily, an entrepreneur having strong interaction with their close family friends may get a solution or support to overcome the issues. Through support, he may become able to perform and recover his losses, resulting in an increase in their F-OSB's performance.

This study found that an entrepreneur's mindfulness has a significant positive relationship with F-OSB performance. The results are aligned with Sutcliffe et al. (2016) and King and Haar (2017). Sutcliffe et al. (2016) found that an individual's mindfulness improves performance outcomes. Moreover, King and Haar (2017) indicated that an individual's cognitive capabilities improve innovativeness in a firm and result in its high performance (King & Haar, 2017). High mindful traits entrepreneurs set the F-OSB's performance target and devise strategies to attain the set target. High mindful entrepreneurs analyze customers' needs, sketch the situational diversity, make plans, and devise strategies to execute their plans successfully. For instance, a mindful entrepreneur controlling a retail store may provide an online purchase facility, along with free home delivery. Thus, technological advancement by mindful entrepreneurs not only improves their performance but preserves their legacy as well.

6. Conclusion

The study investigates the effect of self-compassion characteristics (self-judgement, self-isolation and mindfulness) on F-OSB performance. The results revealed that the low self-judgemental characteristics of entrepreneurs are less critical of themselves. They are more judgemental about the accuracy of their decisions and their effect on their business performance. However, due to COVID-19 greater number of entrepreneurs have turned self-judgemental. This phase of self-judgemental may not let them recover their bold decision-making capabilities. Thus, F-OSB may suffer more even after the pandemic. The association between self-isolation and F-OSB's performance is negatively significant, so it can be deduced that entrepreneurs who have self-isolated themselves have become more psychologically weak. They perceive that there is nothing left behind, and they can never build up their business again and lose the legacy and temptation of their business. Such entrepreneurs are at the lowest level of their psychological well-being. In such a situation, they may become psychological patients and become violent individuals in this society. Thus, it may result in not only F-OSB's failure but domestic violence as well. The relationship between mindfulness and F-OSB's performance is positively significant. It indicates that mindful entrepreneurs are vigilant and anticipate the consequences of action beforehand. They anticipate the future and take the initiatives to minimise the effect of any critical phase. Thus, through diversification of their portfolios, mindful entrepreneurs remain involved in the business and become able to generate more revenue to successfully handle their F-OSB.

6.1 Limitations and Future Research

The present study has some limitations. It has investigated the three constructs of self-compassion. However, there is a need to investigate the rest of the three constructs as well. The target population in this study consists of five developed districts out of thirty. Thus the results of this study cannot be generalized to the whole population. There is a need to conduct this study in the context of other districts of Pakistan. In this study, data is collected during the pandemic. However, a post-pandemic study should be done to compare the results. In addition, a comparison study should be performed between Muslim and non-Muslim, developed and developing countries. There is a need to induce moderating mechanism between these exogenous and endogenous variables. For instance, financial literacy, education level or business experience can be potential moderators.

6.2 Theoretical Implications

The findings of this study offer several theoretical and research implications. First, it contributed to the F-OSB literature by revealing that components of self-compassion, self-judgment, self-isolation, and mindfulness are important predictors of F-OSB's performance. This study revealed that entrepreneurs who isolate themselves from their social circle or start blaming themselves (self-judgment) for a loss lead their business towards poor performance. However, entrepreneurs having high mindfulness may anticipate their

future obstacles to attain the required level of performance. Drawing from the self-control theory, it can be deduced that entrepreneurs become more self-judgmental when unable to achieve their goals. A wrong-set target may increase self-judgment and reduce FB performance. Self-control theory further helps to explain that insufficient efforts or the inability of the entrepreneur to control the desires lead to self-isolation. High self-isolation leads to business failure. In addition, this study explains that entrepreneurs having high mindfulness visualize and rationalize their future and set high-order goals to enhance or maintain their business performance.

6.3 Practical Implications

Our study provides insight that entrepreneurs face upward and downward sales and profitability trends. These trends may be due to changes in seasonal or economic unrest or stability. For instance, a long downward trend in sales and profitability during COVID-19 put entrepreneurs in a negative psychological state of mind. So, this study chooses self-compassion to look in-depth into this issue. The results suggests that entrepreneurs should be intact in their social circle, particularly during the long downturn period of their family business. In this way, they might gain some financial, social, or moral support and become able to save themselves from being a victim of self-judgment or self-isolation. This study highlighted that the pandemic hurts the entrepreneur's financial position and raises psychological issues. This study implied that vaccination and the financial package provided by the government are not enough for FB's performance and survival. Still, psychological support and training should also be part of during and post covid treatments. Thus, among various post-recovery programs proposed by the various governments,' the entrepreneur's psychological recovery program must be proposed to attain inclining growth and profitability of the F-OSBs. Governments should activate entrepreneur support programs through virtual gatherings. Officials should listen to their problems and allocate specific problem-solving committees at district levels.

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Barriers to Digital Financial Inclusion during Covid-19: A Study Using Integrated Delphi – AHP Framework

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Abstract

The state of Kerala has made remarkable progress in the field of financial inclusion. It was among the first states in India to be identified as a 'Total Banking State'. However, the progress achieved with respect to digital financial inclusion has not been proportionate to the success it achieved in terms of account opening. This is particularly important in the current Covid pandemic and the emphasis on cashless transactions. The current study uses the Delphi – AHP Integrated method to identify, prioritise and rank various barriers to digital financial inclusion in PSBs. Using this, the study develops an index for Digital Financial Inclusion barriers. The findings of the study revealed bank officials prioritised Access related barriers (0.387) highest, followed by Awareness & Knowledge related barriers (0.352) and lastly, Attitude barriers (0.261). Further, the study finds significant variability in the Digital Financial Inclusion Barrier level with respect to gender, age, education, income and SHG membership among customers of PSBs.

Keywords *– Digital Financial Inclusion, Barrier, Analytical Hierarchy Process (AHP), Delphi method, Public Sector Banks (PSBs), Covid 19*

1. Introduction

The topic of Financial Inclusion (FI) has been identified as one of the prominent issues in the current development discourse. Since the time of Indian Independence, various governments (centre/state) have prioritised improving financial inclusion. This can be seen from the various initiatives like Jan Dhan - Aadhar – Mobile (JAM) trinity, APY, PMJDY etc. Pursuant to these efforts, financial inclusion also witnessed a rapid increase.

Over the period of time, the concept of financial inclusion has also evolved with improvements in technology. The government has been pushing towards digitalisation and gradually moving towards the goal of a cashless economy. Banking services have been undergoing tremendous changes over the last couple of years due to digitalisation (e.g. digital authentication/transactions using UPI, financial data sharing via account aggregators). The pace of digitalisation has further accelerated following demonetisation and with the ongoing Covid 19 pandemic. However, as the digital transformation started to gather pace, it brought a host of opportunities as well as challenges. In this background, the topic of Digital Financial Inclusion has become all the more relevant.

1.1 Covid Impact

Indian banking sector faced unprecedented challenges during the pandemic fallout, with RBI facing dual challenges of sustaining financial stability while mitigating the impact of the pandemic (RBI, n.d.). Following lockdowns, supply chains froze, demand reduced, credit growth declined, and a rise in precautionary savings was observed.

Despite the overall negative consequences, the pandemic has accelerated digital adoption in financial services. The restrictions imposed by the pandemic (e.g. lockdowns) resulted in both consumers and businesses undertaking online transactions, which has improved their confidence and receptivity. For example, (Deloitte & IIF, 2020) points out that 35 % of their customers have increased their usage of online banking during the pandemic. Further, PayPal reported a 20 % YoY rise in their payments volume, and MasterCard saw a 40 % rise in contactless transfers.

1.2 Government Response to Covid 19 Pandemic

The Indian government's ability to mitigate the impact of the pandemic and enable fast recovery was greatly supported by financial inclusion programmes and strategies developed years ago. For example, the National Strategy for Financial Inclusion (2019-2024), National Strategy for Financial Education (2020-25), National Mission for Financial Inclusion (launched in 2014), Digital India Program (2015) etc., provided a coordinated approach towards financial literacy, financial inclusion, digital literacy, securing the unsecured (via micro-insurance), funding the unfunded (via loans to SHGs & MSMEs, credit guarantee schemes etc.) as well as consumer protection measures ensuring access and enabling increased usage of banking services to the last mile customers as well as boosting the level of digitalisation (ADB, 2021; Das, 2021). Further, the 24x7x365 availability of centralised payment systems (e.g. NEFT, RTGS) lowered risks and improved the efficiency of the entire payment system (RBI, 2021b).

In response to the pandemic, the Indian government announced an economic package of Rs. 20 lakh crores. The policy measures undertaken by the government can be broadly categorised into 1. Fiscal policy measures 2. Monetary policy measures 3. Collaboration with the private sector (AFI, 2021). These include emergency relief aid and direct support to sectors like health, approximately $4 billion support to 200 million low-income women account holders, subsidies & cash support to 90 million farmers, PMSVANidhi program to provide small ticket digital loans to street vendors, reduction in interest rates, loan moratoriums, direct credit interventions etc. (ADB, 2021).

Further, to accelerate financial inclusion via digitalisation in tier 3-6 centres, the Payment Infra Development Fund (PIDF) is being operationalised (Das, 2021). Additionally, RBI has renewed its focus to ensure at least 1 district in every state is 100 % digitally enabled. The banking sector also announced a temporary waiver of fund transfer charges to encourage digital payments.

In response to the pandemic, Kerala was among the first states to announce an economic revival package of Rs. 20,000 crores (Govt. of Kerala, 2020). Some of the major announcements in the package included a) 7 months lump sum pension payment to support beneficiaries, b) Rs. 500 crore comprehensive health package, c) SHG loans of Rs. 200 crore via the Kudumbashree programme, d) expansion of employment guarantee programme with a support of Rs. 2000 crores, etc. Further, a special package of Rs. 3434 crores to revive the MSME sector was announced later.

2. Background of the Study

2.1 Digital Financial Inclusion

CGAP (2015) defines Digital Financial Inclusion as *"digital access to and use of formal financial services by excluded and underserved populations, delivered responsibly, at a cost both affordable to customers and sustainable for providers"*.

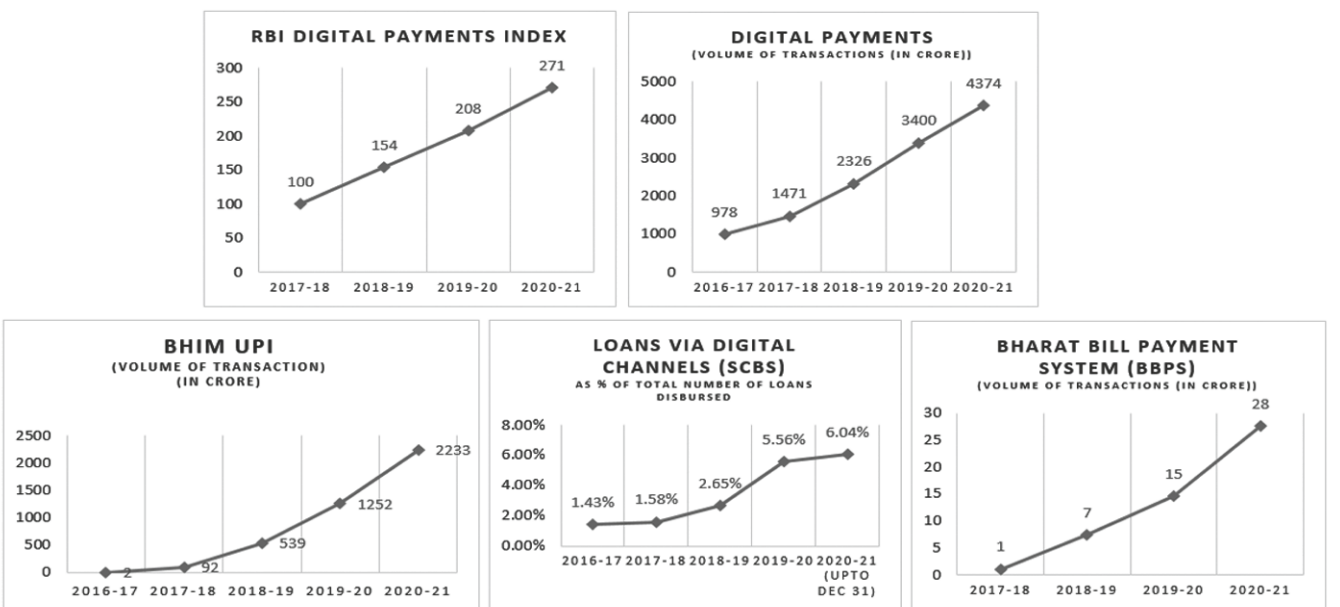
Policymakers consider Digital Financial Inclusion which emphasises the role of technology in increasing accessibility with respect to financial services, as the 4th stage of the financial revolution after the developments in microcredit, microfinance and financial inclusion (Tay et al., 2022; Wang & Guangwen, 2022).

Aziz and Naima (2021) identify Digital Financial Inclusion as the intersection of financial inclusion (financial literacy and financial access), digital inclusion (digital accessibility, digital affordability, digital ability) and lastly, social inclusion (social capital, social networks). Bill and Melinda Gates Foundation (n.d.) points out that digital payment systems should be a) Accessible (with respect to all sections of the population), b) Reliable (with respect to safety), c) Valuable (offering benefits over using cash), d) Affordable, e) Profitable (for developing sustainable business models), and f) Interoperable in order to be genuinely inclusive.

The Covid outbreak has re-emphasised the pivotal role of access to financial services for speedy economic recovery. Moreover, recognising the potential of the digital economy in the new world order post-pandemic, many governments across the world gave increased push towards digital transformation.

2.2 Progress in Digitalisation

RBI Digital Payments Index (based on payment enablers, payment infrastructure - demand side factors, payment infrastructure - supply side factors, payment performance, consumer centricity) to assess the progress of digitalisation and penetration of digital payments witnessed a steep rise from 100 (Base figure - 2017-18) to 271 in 2020-21 (RBI, 2021b)**.** This is supported by growth observed in various digital parameters (volume of transactions). For example, digital payments rose to 4374 crores in 2020 -21 from 978 crores in 2016-17. Additionally, BHIM UPI payments increased from 2 crores (2016-17) to 2233 crores (2020-21) while Bharat Bill Payment System (BBPS) rose from 1 crore to 28 crores (volume of transactions) etc. (RBI, 2021b) as shown in Figure 1.



Source: (RBI, 2021b, 2021a)

Figure 1. Progress in Digitalisation (India)

Further, loans via digital channels for Scheduled Commercial Banks (SCBs) as a percentage of the total number of loans disbursed rose from 1.43 % (2016-17) to 6.06 % (2020-21). As per (RBI, 2021a), although digital lending is still at a nascent stage relative to the physical mode in the case of SCBs, as shown in Figure 1, the segment witnessed rapid growth. The report further points out that supply-side as well as demand-side drivers have supported the spurt in digital lending. Supply-side drivers can be broadly categorised into a) Technological advancements (e.g. Artificial Intelligence, Big Data Analytics, Cloud Computing, Alternative Data, Vertical Search Engines, Distributed ledger), b) Government initiatives (e.g. Jan Dhan Yojana, Digital India, India Stack, Start-up Ecosystem, Aadhar enrolment), c) Regulatory enablers (e.g. Regulatory sandbox, Financial Inclusion initiatives, RBI Innovation Hub), d) Information & Communication Technology (ICT) Infrastructure - Rapidly growing internet and mobile penetration. Demand side drivers can be broadly categorised into a) Demographics (e.g. Relatively higher proportion of young population, aspirational consumers driven by lifestyle requirements), b) Economic development – e.g. Growth in per capita GDP and net national income, c) Unmet Demand (e.g. Low credit penetration in rural areas and informal economy), d) Covid 19 pandemic (resulted in reduced mobility, social distancing etc.).

2.3 Benefits Associated with Digital Financial Inclusion

Digital financial services a) enable financially excluded sections without collateral to access credit support from formal financial institutions by helping to create credit scores (Ayadi & Mais, 2020) b) cashless transactions can help financial institutions identify the financial behaviour of customers apart from increasing the transparency in various transactions (Ayadi & Mais, 2020), c) Jack and Suri (2014) points out the dampening role of digital financial inclusion during an economic shock. Adoption of digital payments is positively correlated with higher GDP growth and faster economic recovery via a) ensuring consumer access to institutional credit, b) receiving government support, c) improving individual consumption, saving, investment as well as overall productivity (GFPI & World Bank, 2021; IMF, 2020) d) GFPI (2020) finds increased levels of inclusion is associated with improved gender equality as well as encouraging entrepreneurship among women. This can help them to be resilient while facing various financial shocks. e) Bandura and Ramanujam (2021) find an improved level of digitalisation results in lower time and expenses and improves security via enhanced authentication with respect to payments. Further, they act as entry points through which the user is introduced to other financial products like savings, deposits, insurance etc. f) digital payments can support vulnerable people in overcoming psychological barriers to savings with the help of automatic deposits, scheduled tax reminders etc., g) digital wages as a preferred mode of payments over cash as it ensures better safety and also helps in building the users savings (GFPI & World Bank, 2021)

A 20 % increase in the Asian digital sector could result in a $1 trillion rise in trade revenue and create up to 65 million jobs per year (ADB, 2021). Further, USAID (2019) finds delivery of digital as well as mobile financial services in emerging economies has the potential to a) increase up to $ 2.1 trillion volume of loans extended to businesses and individuals, b) increase access to 1.6 billion people with respect to financial services (which includes more than 50% women), c) Help governments save $ 110 billion every year by reducing leakage with respect to government spending and tax revenue, d) 80-90 % cost reduction in terms of providing financial services d) help assess the credit worthiness of potential borrowers etc.

2.4 Digital Financial Inclusion: Opportunities during Covid 19

Despite the overall negative economic consequences following Covid 19, accelerated digitalisation has opened up several opportunities. The pandemic has reduced the traditional barriers to digital transformation and is increasing financial inclusion even where a decline in traditional financial inclusion is observed (IMF, 2020). Realising its importance, (Bandura & Ramanujam, 2021) identifies 'digital transformation' as an enabler in terms of UN Sustainable Development Goals (SDG).

IMF (2020) points out that business continuity and credit flow are supported without disruption with the help of digital financial services and reducing poverty and inequality. Additionally, distressed migrants are able to receive money from their families via cashless transactions (Finextra, 2020). Furthermore, humanitarian cash transfers from NGOs/donors etc., reach refugees with the support of cashless transfers (Hannig, 2020). Next, G2P/P2P transfers to the needy can support the goal of food security at times when supply chain disruptions are caused due to lockdowns and other restrictions resulting in a steep increase in the prices of essential items (Schroeder, 2020). Further, by reducing people's movement and using contaminated notes / ATMs, they reduce the chances of virus spread (Goyal, 2020). Also, digital financial services can play a pivotal role

in ensuring the efficient transmission of government macroeconomic policy benefits, thereby facilitating economic recovery (Ayadi & Mais, 2020). Government welfare support following Covid 19 will likely boost financial inclusion by opening more bank accounts and improving overall digital adoption (Saroy et al., 2022). Further, it helps to lower leakage, avoid ghost recipients, as well as helps improve traceability for the payment process (Bandura & Ramanujam, 2021).

2.5 Challenges due to Covid 19

The economic impact of Covid 19 has disproportionately hit the poor, vulnerable, and minority segments of the population harder than the rest (World Bank, 2020a). For example, ILO (2021) and World Bank (2020a) finds a higher proportion of job losses among women, higher vulnerability and lower resilience among women-led MSMEs, particularly in the informal sector, compared to larger firms (AFI, 2021).

Informal sector workers representing more than 80 % of the workforce, particularly in low, and middle-income countries, have been impacted as only a few jobs can be done from home (Dingel & Neiman, 2020). Further, ILO (2020) points to a 60 % drop in informal sector workers' income.

In the case of migrants, following the pandemic-related containment measures, the closure of regional/state/national boundaries resulted in job losses, a reduction in remittance flows by around 20 % to low/middle-income countries etc. (World Bank, 2020b).

2.5.1 Covid-19: Barriers to Digital Financial Inclusion

The new wave of digital transformation is widening the already existing digital divide and has put forward a host of additional risks (Jurzik et al., 2020). For example, the digital transition would result in the rise of new digital jobs and technologies requiring different skill sets, and those in the lower sections, particularly in developing countries, might be disproportionately affected. Further, significant challenges exist in terms of access and availability of technology (e.g. PC, smartphones), connectivity infrastructure (e.g. high speed internet), user skills (e.g. digital & financial literacy), concerns about safety/reliability/ interconnectedness as well as potential biases resulting from the availability of new data sources/analytics (ADB, 2021; Bandura & Ramanujam, 2021).

2.6 Types of Financial Exclusion

The European Commission (2008) report finds three categories of financial exclusion in terms of a) *Unbanked category* (No access to bank accounts), b) *Marginally banked* (using financial services less frequently /having fewer facilities) c) *Fully banked categories* (having access to a wide range of financial services). Kempson and Whyley (1999) identify the following five categories of exclusion, i.e. a) *Access exclusion* (restricted access due to risk management), b) *Condition exclusion* (restrictions imposed in the form of terms and conditions), c) *Price exclusion* (restrictions in terms of affordability of financial products), d) *Marketing exclusion* (marketing strategies focussing on mid – high income categories excluding low-income groups), e) *Self-exclusion* (due to fear of access rejection by service providers).

2.7 Digital financial inclusion in Kerala

Kerala has been identified as a frontrunner in terms of financial inclusion as well as digitalisation activities. This can be seen from the fact that 12 out of 14 districts in Kerala are identified as 'high FI' districts as per the CRISIL Inclusix Report (CRISIL, 2018). Further, the state is also identified as a 'Total Banking State' (PTI, 2011).

Although Kerala has successfully ensured the first objective of financial inclusion regarding household account ownership, it has not fully succeeded in ensuring all the accounts remain active. This can be seen from the report by the Centre for Financial Inclusion and Microfinance Information Exchange (MIX) (2016), which points out a high share of dormant/inactive accounts in Kerala. Further, from the overall financial inclusion perspective, one of the major issues identified with the overall accelerated digital transformation process is the relative exclusion of certain vulnerable categories (e.g. women, old aged, rural). This has also impacted the government's digital financial inclusion drive, particularly after demonetisation and the onset of the Covid 19 pandemic.

2.8 Role of Public Sector Banks in Financial Inclusion

Public Sector Banks (PSBs) forms a pivotal role in achieving the financial inclusion goals of the state. PSBs occupy the largest share of bank branches in rural areas, while private sector banks mainly concentrate in urban/semi-urban/metro areas (RBI, 2020). Further, PSBs serve the largest number of PMJDY accounts, with a 79 % share in terms of beneficiary

number (PMJDY, n.d.). PSBs alone account for around half the total number of financial access points in Kerala. Hence, they play an important role as transmission and implementation vehicles in which the government's monetary/ fiscal policies can reach the intended beneficiaries (Das, 2020).

Having understood the role of PSBs in the financial ecosystem, it is shocking to see that the market share of PSBs (deposits, advances) has declined over the years (RBI, 2019b). Further, PSBs lag behind their private-sector peers w.r.t digital transactions (RTGS, NEFT, mobile transactions, credit cards etc.) (Moharkan, 2019).

It is in this background that the current study is undertaken. Further, the study is unique in identifying and ranking the various barriers towards digital financial inclusion, followed by developing a 'Digital Inclusion – Barrier Index' considering the unique characteristics of Kerala using the Delphi – AHP integrated technique. Further, the role of barriers among various socio–economic and demographic groups are also analysed. The study is expected to provide financial institutions and policymakers with a handy tool to make informed decisions.

3. Objectives and Hypothesis of the Study

The objectives of the current study are

- To identify, prioritise and rank various barriers to Digital Financial Inclusion.
- To develop a Digital Financial Inclusion Barrier Index and classify customers based on their barrier level (Low/Medium/High) with respect to Digital Financial Inclusion.
- To analyse Digital Financial Inclusion – Barrier level concerning the socioeconomic and demographic level of Public Sector Bank (PSB) customers.

Based on the above objectives, in the context of Covid 19, the following hypothesis has been framed.

- H0: There exists no significant association between the Digital Financial Inclusion Barrier level and various socioeconomic and demographic parameters.

Keeping these objectives in mind, the rest of the paper is arranged as follows, i.e. Section 4 introduces the conceptual framework of the study. Section 5 provides a detailed explanation of the Delphi – AHP integrated methodology used in the current study. Sample selection for the judging panel consisting of bank officials, as well as sample selection for customers of Public Sector Banks, is undertaken in Section 6. Next, results obtained from the Delphi method and AHP analysis, followed by results of the various statistical analysis undertaken to test the association of Digital Financial Inclusion – Barrier level with respect to the socioeconomic and demographic level of customers, is summarised in Section 7. Finally, Section 8 provides the various conclusions and recommendations derived from the study.

4. Conceptual Framework - Digital Financial Inclusion

The study developed a conceptual framework, as shown in Figure 2, with the help of a Venn diagram in which digital financial inclusion is shown as the intersection of financial inclusion and digital inclusion.

Here, Financial Inclusion and Digital inclusion are identified as given in Figure 3.

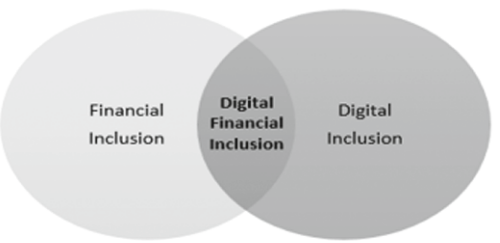


Figure 2. Conceptual Framework

Figure 3. Financial Inclusion, Digital Inclusion

Source: *(European Commission, n.d.; GoI, 2008; Rajan, 2009)*

Both financial inclusion and digital inclusion are multidimensional concepts. The current study uses the following dimensions concerning financial inclusion and digital inclusion to analyse the barriers concerning digital financial inclusion, i.e. 1. Awareness and Knowledge 2. Access 3. Attitude.

The study identified a lack of formal education, low financial and digital literacy as subdimensions of awareness and knowledge. Next, access barriers are measured in terms of issues with respect to payment systems, product design issues, maintenance costs, lack of support from banks/staff, lack of documents, and low/irregular income. Finally, cultural norms, trust, and confidence issues are used to measure attitude barriers.

5. Delphi – AHP Integrated Framework

Delphi – AHP integrated decision-making framework via aggregating group judgements improve decision-making efficiency (Taleai & Mansourian, 2008). In the integrated Delphi – AHP framework, initially, the Delphi technique identifies the main criteria from expert opinion, followed by the AHP method, which prioritises the shortlisted criteria identified using the Delphi technique previously (da Cruz et al., 2013).

Arof (2015) points out multiple applications of the Delphi – AHP integrated framework in various fields, including forecasting (Mishra & Deshmukh, 2002), Strategic Planning (Gerdsri & Kocaoglu, 2007) etc. In this background, the current study uses an integrated Delphi – AHP technique.

The current study consists of 3 stages to identify, rank and prioritise various barriers to digital financial inclusion, as shown in Figure 4. The first stage involves undertaking an extensive literature review to identify the first list of criteria to be evaluated. The second stage involves undertaking the Delphi method to shortlist the important criteria identified using a literature review. In the third stage, the AHP technique is used to prioritise shortlisted criteria identified using the Delphi method with the help of an expert panel of judges.

Stage1: Extensive literature review was undertaken to identify the various barriers to financial inclusion

Demand Side Barriers: Demand side barriers that result in financial exclusion include a) *Gender*: Women experience more credit-related constraints than men (Tuesta, 2013; Sukumaran, 2015), b) *Education Level/Financial Literacy Level*: Financial exclusion was found to be inversely related

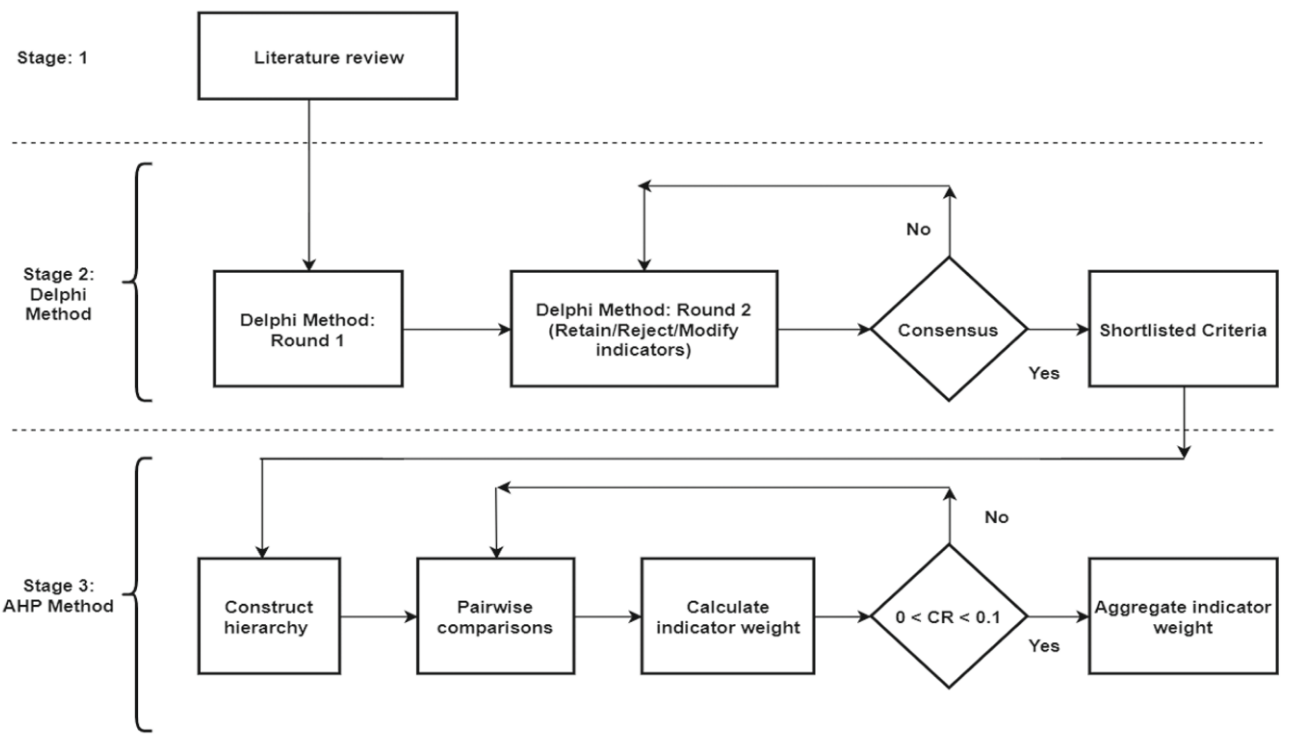


Figure 4. Delphi AHP Integrated Framework

to the level of education (Allan et al., n.d.; Martínez et al. 2013), c) *Income Level*: Financial exclusion was found to be disproportionately higher among the poor compared to middle and high-income segments of the population (Pal & Pal, 2012), d) *Age*: previous studies (Allan et al., n.d.) have identified relatively higher financial exclusion levels among the young (<24 years) and senior citizens (> 60 years) categories.

Supply Side Barriers: Supply side barriers that result in financial exclusion include a) *Geographical Distance / Timing of financial institution*: Exclusion level was found to be higher among rural/hilly areas etc. (where financial institutions cater to a large geographical area) due to the higher opportunity costs concerning wage loss, travelling expenses (Allan et al., n.d.). b) *Customer Capacity*: Lack of KYC documents, ID proof, collateral to pledge etc., can result in exclusion from formal financial institutions (Carstens, 2019). c) *Lack of customised products*: Different segments of the population have different needs and expectations. A homogeneous approach without taking into consideration the varied needs of different categories can result in exclusion (Dvara Research, 2021; OECD, 2020)

Dimension wise: Previous research has identified the following list of dimensions to study financial inclusion and exclusion, i.e. a) *Financial Awareness*: Lack of knowledge/ awareness concerning financial products and services can negatively impact confidence level, participation level in financial markets as well as result in exploitation by moneylenders and indebtedness etc.(Atkiinson, A.; Messy, 2013; IRDA, 2012), b) *Financial Availability*: As per GSMA (2014), low digital infrastructure (e.g. smartphones, broadband connection) negatively impact financial availability c) *Financial Access*: (Allan et al., n.d.; Duflos & Li Ren, 2020; Kempson & Whyley, 1999; Rao & Baza, 2017; Rojas-Suarez, 2011) identifies barriers in the form of high transaction costs, poor use of technology, geographical distance from the bank, lack of documents, lack of customised products etc. impacting financial access, d) *Usage*: (Grameen Foundation, 2013; Heitmann et al., 2018; SEEP, 2015) finds financial illiteracy, high transaction costs, insufficient product customisation, delay in opening accounts, disruptions with respect to service offerings, technical glitches, fear of hidden charges etc. negatively impacting usage of financial products, e) *Attitude and Behaviour*: Factors like fear of rejection, indebtedness, fraud, and lack of trust significantly impact the use of financial services by individuals (Carstens, 2019; Dittus & Klein, 2011; Yakubu et al., 2017) etc.

Digital Divide: As per OECD (2001), the concept of the digital divide includes multiple aspects such as access, use, and performance, as well as multiple dimensions (global, regional, and social).

Helbig et al. (2005) analysed the digital divide using three approaches, i.e. a) the Technology access approach, b) Multi dimension approach c) the Multi-perspective approach (Srinuan & Bohlin, 2011). Further, in the technology access approach, the major factors identified are a1) *Infrastructure availability* (LaRose et al., 2007; Ngini et al., 2002; Simpson et al., 2004), a2) *Infrastructure investment* (Avila, 2009; Chaudhuri et al., 2005; Hawkins, 2005). Next, the multidimensional approach identifies b1) *income/ socioeconomic status* (Bagchi, 2014; Dwivedi & Lal, 2007), b2) *Skills and experience* (Gauld et al., 2010; LaRose et al., 2007), b3) *Geographical location/population density* (Bagchi, 2014; Gauld et al., 2010; Simpson et al., 2004), b4) *Education/literacy level* (Eastman & Iyer, 2004; Zhao et al., 2007), b5) *Family structure* (Hitt & Tambe, 2007; Schleife, 2010), b6) *Age* (Chaudhuri et al., 2005; Dwivedi & Lal, 2007; Schleife, 2010), b7) *Cost of access* (Robertson et al., 2007), b8) *Occupation* (Chaudhuri et al., 2005; Schleife, 2010), b9) *Marital status* (Rice & Katz, 2003). Finally, the multi-perspective approach considers c1) *institution/type of govt*. (Simpson et al., 2004), c2) *Race* (Chaudhuri et al., 2005), c3) *Ethnicity* (Middleton & Chambers, 2010), c4) *Gender* (Chaudhuri et al., 2005; Rice & Katz, 2003), c5) *Culture* (Zhao et al., 2007), c6) *Language* (Wetzl, 2010), c7) *Psychological factors* (attitude, trust etc.) (Bagchi, 2014; J. Das et al., 2009), c8) *Content* (Ngini et al., 2002; Rice & Katz, 2003; Simpson et al., 2004), c9) *Speed/service quality* (Ngini et al., 2002).

Further, Aissaoui (2021) reviewed three types of the digital divide based on access, use, result/performance with respect to ICTs. a) *The first-level divide*: Hartviksen et al. (2002) and Lentz and Oden (2001) use an element of Technological determinism (which considers technology as the sole cause of the evolution of society) (Aissaoui, 2021), while van Deursen and van Dijk (2019) focussed on resources and appropriation theory (according to which, the unequal distribution of resources resulting in disparities with respect to internet access is caused by categorical inequalities in the society) in their studies with respect to first level digital divide (Aissaoui, 2021). Van Deursen and Andrade (2018) identify motivation and access to technology as the two major factors with respect to the first-level digital divide. Covid 19 exposed the first level digital divide with access to digital technology (e.g. internet) as an important criterion for people to stay connected, take online classes, work from

home, etc. (Aissaoui, 2021). b) *The second-level divide*: This perspective of the digital divide considers differences in cognitive skills as well as specific knowledge with respect to the use of ICTs. In this regard, (van Deursen et al., 2016) identified four types of skills, i.e. a) operational skills, b) informational skills, c) social skills d) creative skills. Further, DiMaggio and Hargittai (2001) and Hargittai (2002) identified a) disparities in the technical means, b) inequality with respect to internet usage autonomy, c) skill differences, d) inequalities concerning social support etc., as the major factors responsible for the second level digital divide. The current crisis has emphasised the need to acquire new digital skills (e-skills) to ensure business continuity (Aissaoui, 2021). c) *The third-level divide*: This perspective of the digital divide considers differences in the capacity to mobilise various digital resources to achieve specific objectives. For example, during the pandemic period, countries that are leaders in the latest technologies applied it to identify, track as well as forecast Covid 19 impact and thereby lower their socioeconomic impacts relative to others (Aissaoui, 2021)

Stage 2: In this stage, the Delphi method is undertaken. To ensure consistency, the current study uses two rounds in the Delphi method. In the first round, a telephonic interview was undertaken, and the criteria obtained from the literature review were discussed. In the second round, face to face meeting was conducted with experts to determine which criteria are to be retained/rejected/modified. Then, depending on the Content Validity (CV) and Content Validity Ratio (CVR), the final set of relevant indicators is identified once a consensus is reached between various experts.

Stage 3: Next, the study uses the AHP technique to prioritise various relevant indicators identified from the Delphi method, acting as a barrier to digital financial inclusion. Pairwise comparison matrices are developed from the results of Saaty's scale analysis. Local weights, as well as Global weights of various indicators, are generated and ranked for comparison.

Finally, a Digital Inclusion Barrier Index is developed, considering the priority weights generated using the AHP technique.

Digital Inclusion Barrier Index = (BA.1*Lw1) (BA.2*Lw1) (BA.3*Lw1)

Once the Digital Inclusion Barrier Index is developed, a customer survey is undertaken to understand the perceived level of digital inclusion barrier for Public Sector Bank (PSB) customers, followed by detailed statistical analysis to test the association of Digital Financial Inclusion – Barrier level with respect to the socioeconomic and demographic level of customers.

A detailed explanation concerning each method is given in the following subsections.

5.1 The Delphi Method

The Delphi methodology is a systematic and interactive method developed in 1946 by RAND corporation, which is a useful technique to collect, analyse, and forecast expert opinion useful in situations to combine individual judgements to form collective decision-making when there is a lack of clarity on an issue (Dalkey & Helmer, 1962; Rowe & Wright, 1999).

The technique has been identified as suitable for consensus-building (Hsu & Sandford, 2007), supporting qualitative long-range forecasting (Gupta & Clarke, 1996). As per Stewart (2001), the Delphi method consists of both qualitative and quantitative techniques.

Further, the Delphi technique offers various advantages and these include (Arof, 2015; Rao et al., 2010),

a. Cost-effective – The technique combines expert opinion from geographically distant locations, reducing cost/time compared to face-to-face meetings (Hasson et al., 2000; Hsu & Sandford, 2007).

b. Facilitates group consensus without being influenced by interpersonal factors (DeVilliers et al., 2005; Meyrick, 2002)

c. Participants feel a sense of accomplishment (Delbecq et al., 2004).

d. The technique helps to generate additional insights, thereby helping the respondents to re-assess their initial judgements as the method involves multiple iterations (Rowe & Wright, 1999).

e. The technique ensures anonymity and confidentiality between various respondents, avoiding confrontation between experts and avoiding influences with respect to status, personality, group pressure etc. (Charlton et al., 1981; Sekaran & Bougie, 2009; Sumsion, 1998).

Delphi technique has been classified into (Arof, 2015; Hasson et al., 2000; Stewart, 2001) Classical Delphi, Decision Delphi, Policy Delphi, Modified Delphi, Real-Time Delphi, e- Delphi, Online Delphi, Disaggregative Policy Delphi etc.

The Delphi technique consists of the following steps i.e.

a. Identification/Selection of expert panel

b. Identifying the assessment parameters based on the literature review

c. Round 1: Sending Questionnaire

d. Modify Questionnaire based on the Round 1 assessment

e. Round 2: Send revised Questionnaire based on Step (d)

f. Continue from Step (c) till consensus is reached

g. Finalise the parameters

5.2 Analytical Hierarchy Process

Analytic Hierarchy Process (AHP) is an important, widely used mathematical method based on Multi-Criteria Decision Making (MCDM) technique. Developed by Saaty (Saaty, 1977, 1980), the ratio scale measurement technique enables the simplification of complex and subjective problems. Since its development, AHP has been used for various applications, including prioritising/ranking, selection of best alternatives, resource allocation, planning etc. (Andijani, 1998; Lalib & Williams, 1998; Armacost & Hosseini, 1994; Kurian, 2021; Badri, 1999).

The AHP method has been considered in the current study due to various advantages such as (Oguztimur, 2015; Rajnish, 2016; Saaty, 2013),

a. AHP breaks down complex problems and helps decision-makers reach consensus.

b. The technique helps decision makers to prioritise the various significant factors.

c. Decision-makers can verify their decisions' consistency based on the consistency ratio's value.

d. It is considered a robust method in cases where the decision has to be made with limited information.

e. Flexibility to be integrated with various techniques like the Delphi method, linear programming, fuzzy logic etc.

The various steps involved in the AHP method are as follows,

a. Defining the problem and determining its goal

b. Identifying various criteria, sub-criteria

c. Structuring the decision problem into a hierarchy with a goal at the top followed by criteria and sub-criteria.

d. Aggregate matrices are developed based on average pairwise comparison matrices using data obtained from 1-9 Saaty Scale.

e. Calculation of consistency ratio to ensure consistency of various responses

f. Calculation of local weight, global weights, priority ranking

6. Sample/Panel selection

6.1 Sample selection of respondents (customers) of PSBs: Socio-economic and demographic analysis based on the Digital Inclusion Barrier Index

The study uses a multi-staged stratified random sampling technique to identify 200 Public Sector Banks (PSBs) customers from 25 panchayats of Kerala.

6.2 Sample selection of experts: Delphi – AHP based Digital Inclusion Barrier Index

To undertake Multi-Criteria Decision Making techniques, it is essential to have a panel of experts from the chosen field of study. As per State Level Bankers Committee Data, the total PSB branches (and branch heads) in Kerala stands at 3305, out of which 961 are located in the representative districts. The current study identified 25 branch heads (Managers) from various Public Sector Banks (PSB) branches. The panel of 25 branch heads of PSBs was identified from the same 25 panchayats as given in section 6.1 (Branch Head of the PSB having the highest total businesses in the identified area was selected for the judging panel)

7. Results and Discussion

7.1 Results from Delphi Analysis

The literature review had identified various relevant barriers with respect to digital financial inclusion. The 2-stage Delphi analysis reduced the number of key barriers (with $CV < 0.5$ and $CVR > 0.29$) to 12. The barriers include – lack of formal education, low financial literacy, low digital literacy, issues with respect to payment systems, product design issues, maintenance costs, lack of support from bank/staff, low/irregular income, cultural norms, trust issues, and confidence issues. These 12 variables were divided into three main categories, i.e. Awareness & Knowledge barriers, Access barriers, and Attitude barriers. A brief description of the various barriers identified is given next.

7.1.1 Discussion on Awareness and Knowledge barriers

7.1.1.1 Barrier with respect to Formal Education: Human behaviour and actions are shaped by a cumulative result of various social institutions as well as organisations (Hall & Taylor, 1996). By acting as a conduit with respect to external social, economic, and political conditions, these social institutions constrain human behaviour (Mzobe, 2015). Further, previous studies also pointed out the importance of childhood education (e.g. understanding economic concepts) in terms of making rational decisions (Beutler & Dickson, 2008; Furnham & Argyle, 1998; Roland-Lévy, 1990). Additionally, (Atkiinson & Messy, 2013) also points out that a low level of formal education exacerbates barriers like language issues and unfamiliar language terminologies, making it hard for them to undertake transactions with formal financial institutions.

7.1.1.2 Barrier with respect to Financial Literacy: Financial literacy enables people to take responsible financial behaviour undertaking a trade-off between risk vs return ensuring individual financial well-being (OECD INFE, 2011).

Lack of awareness in terms of knowledge of various financial products (deposits, loan, insurance, consumer protection etc.) prevent individuals from demanding appropriate products (Atkiinson & Messy, 2013). Further, low awareness may also result in customers piling up debts, higher transaction fees, higher interest rates etc. (Lusardi, 2019).

7.1.1.3 Barrier with respect to Digital Literacy: As per American Library Association (ALA) (n.d.) Digital literacy ensures individuals are aware of various digital tools and has the skills to effectively use them for social engagement. The term digital financial literacy has become more important, particularly in the past couple of years following the development of the 'gig economy', the rise of fintech and advancements in digital platforms which serve as platforms for delivering financial products.

However, with the rise of digital platforms, chances for individuals being trapped in frauds (phishing, hacking, etc.), mis-selling of products, etc. have dramatically increased.

7.1.2 Discussion on Access Barriers

7.1.2.1 Issues with respect to payment systems**:** In the recent past, with the rise of digital technologies, many countries have experienced 'digital dividends' in the form of faster economic growth, better services etc., via a rise in innovation and efficiency (World Bank, 2016b). However, the payoff from this was not uniform. There exists a large 'digital divide' spread across various socioeconomic and demographic categories like income, age, gender etc., including access to mobile/internet services (World Bank, 2016b). IAMAI (2019) report points out that 51 % of the urban population (age 12 +) has access to the internet, while the same is only 27 % in the case of rural areas; female internet users form about half of the male users, majority, i.e. 65 % internet users belong to the age group 12-29 years. Further, as per (World Bank, 2016b) report, only 1.99 % (age 15 +) of the population had mobile banking accounts, while only 4.27 % (age 15+) used the internet to pay bills online in India.

7.1.2.2 Customisation / Product Design Issues: Customers often find financial products misaligned with their needs. This may result in mis-selling of products resulting in higher prices which could result in a low return for value. This may prompt individuals to go back to moneylenders for their financial requirements.

As per Maslow's hierarchy model, customers' basic financial needs (i.e. lower-order needs) must be satisfied before financial institutions seek to satisfy advanced financial and social needs (i.e. higher-order needs) (Deloitte, 2020). Thus to ensure a higher digital financial inclusion level, it is essential that basic digital financial needs are met before designing complex products.

7.1.2.3 Maintenance and Transactional Costs: EY (2017) report points out that financial institutions, by providing a sufficient mix of innovative products and services with deeper customer understanding at affordable costs, can drive inclusion as well as raise cross-selling opportunities.

Various studies (Toronto Centre, 2019; World Bank, 2016a) have pointed out that high maintenance costs act as a barrier with respect to inclusion, particularly with respect to low-income categories of the population (e.g. minimum balance requirements in savings account act as an entry barrier particularly for those going for their first deposit (Finance Watch, 2020), seasonal income customers find it difficult to repay monthly loan EMIs).

Transaction costs in the form of pecuniary (e.g. minimum deposit requirements, withdrawal fee, opening fee) as well as non-pecuniary costs (e.g. travel costs, opportunity costs, information gathering costs) also act as a barrier in opening bank accounts (Hieltjes & Petrova, 2013).

7.1.2.4 Lack of Documents: A valid ID is essential for an individual during various stages of interaction with formal

financial institutions. Additionally, it also enables service providers to enlarge financial services usage after carrying out due diligence requirements (Appaya & Varghese, 2019). Various documents required for opening an account and undertaking financial transactions include KYC documents like ID proof documents, proof of residence, PAN card details etc.

As per Demirguc-Kunt et al. (2018), in the case of vulnerable sections of the population like rural poor, women, migrants, refugees etc., lack of KYC documents formed a significant barrier in terms of accessing various financial services.

7.1.2.5 Low / Irregular income: Low/irregular income forms another barrier affecting financial inclusion (RBI, 2019a). It creates access barriers via. a) Low-income households may occur higher volatility resulting in a higher need for short-term credit. As these households cannot reduce consumption expenditure, they utilise their savings to smoothen consumption b) They place a higher value on the immediate gratification of needs (Blank, 2008).

As per NABARD All India Rural Financial Inclusion Survey (NABARD, 2018) report, only 9.5 % made any investments in the past year, while only 2.5 % invested surplus income in any financial assets. Further, the amount invested in physical assets was approximately 2.5x investments in financial assets.

7.1.3 Discussion on Attitude Barriers

7.1.3.1 Cultural Norms: Next, social norms have acted as barriers towards financial inclusion, particularly among women. Some of these beliefs include Toronto Centre (2019) a) the image of caregivers at home, thereby restricting their scope with respect to outside financial services/products and entrepreneurial activities b) women cannot take responsible financial decisions, and they should rely on their male relatives c) cultural beliefs that prevent women from owning property or making financial decisions. Further, the lack of a female point of contact while using formal financial services also restricts their usage (Robin et al., 2016).

7.1.3.2 Trust & Confidence Issues: Lack of trust and confidence-related issues in financial institutions can also act as barriers. Multiple bank failures, a rise in online frauds, high rate of transaction failures, particularly in the recent past, can act as barriers preventing people from trusting formal financial institutions. Additionally, a poor financial literacy level can lead to poor financial decision making resulting in low risk vs return and, finally, a higher dissatisfaction level (Carstens, 2019; de Bassa Scheresberg, 2013; Scheresberg & Lusardi, 2014).

7.2 AHP Results

To undertake AHP analysis, the current study developed a hierarchical structure with an objective/goal at the top (1st level), followed by main criteria (2nd level) and finally, sub-criteria (3rd level), as shown in Figure 5.

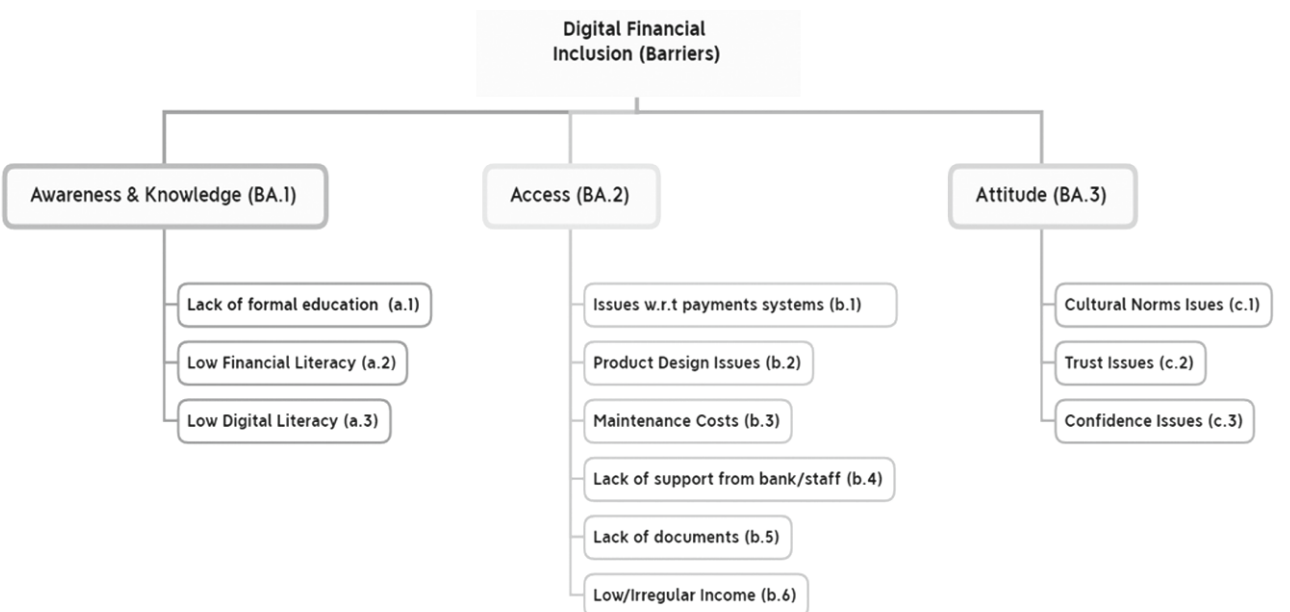


Figure 5. AHP Hierarchy to prioritise Digital Financial Inclusion Barriers

Next pairwise comparisons are undertaken to understand the relative priority within each hierarchical level using Saaty's 9-point scale. Finally, pairwise judgement matrices are formed, as shown in Figure 6.

Next, local priority weights and global priority weights of various dimensions are calculated. A graphical representation of local weights are given in Figure 7, and global weights in Figure 8.

Main Dimensions	BA.1	BA.2	BA.3
BA.1	1.00		
BA.2	1.15	1.00	
BA.3	0.71	0.71	1.00
		CR:	0.24%

Awareness (Barriers)	a.1	a.2	a.3
a.1	1.00		
a.2	1.73	1.00	
a.3	1.00	0.71	1.00
		CR:	0.48%

Access (Barriers)	b.1	b.2	b.3	b.4	b.5	b.6
b.1	1.00					
b.2	1.00	1.00				
b.3	1.41	2.00	1.00			
b.4	0.58	0.71	0.58	1.00		
b.5	0.71	0.58	0.71	0.58	1.00	
b.6	0.71	1.00	0.50	1.41	1.00	1.00
					CR:	1.95%

Attitude (Barriers)	c.1	c.2	c.3
c.1	1		
c.2	2	1	
c.3	2	2	1
		CR:	5.59%

Source: Authors Calculation

Figure 6. Pairwise Judgement Matrices

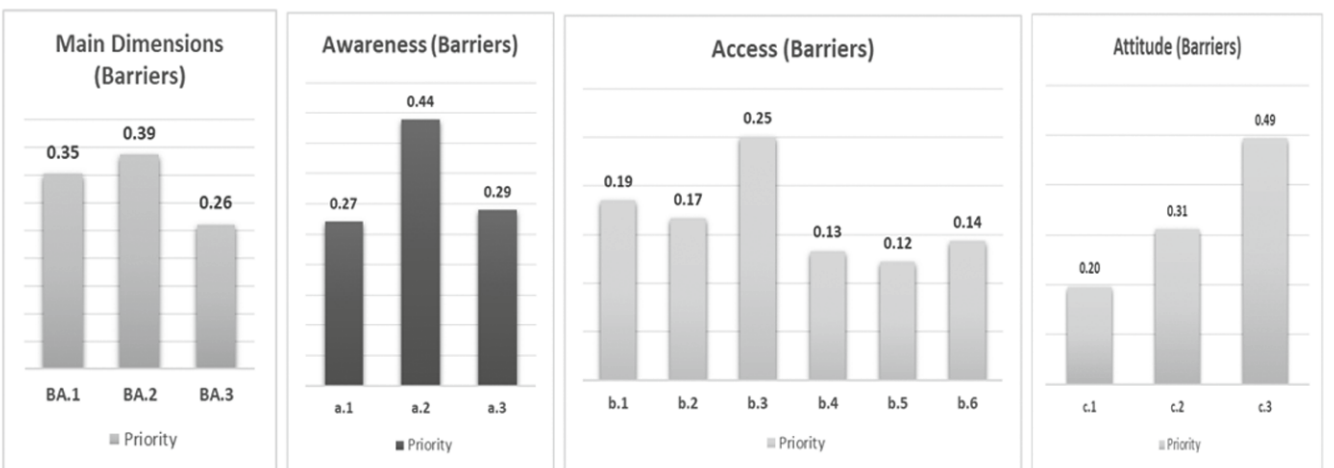


Figure 7. Priority weights (Local weights)

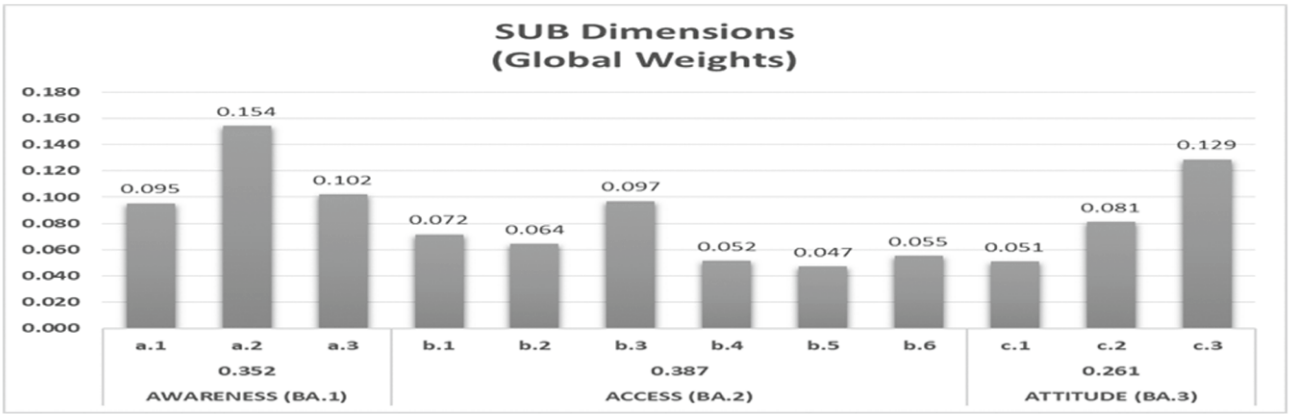


Figure 8. Priority weights (Global weights)

Table 1. Priority weights summary (Digital Financial Inclusion – Barriers)

Main Dimensions	Local Weights (Lw1)	Sub - Dimensions	Local Weights (Lw2)	Global Weights (Gw)	Rank
Awareness & Knowledge (BA.1)	0.352	Lack of formal education (a.1)	0.271	0.095	5
		Low Financial Literacy (a.2)	0.439	0.154	1
		Low Digital Literacy (a.3)	0.290	0.102	3
Access (BA.2)	0.387	Issues w.r.t payments systems (mobile, internet etc.) (b.1)	0.185	0.072	7
		Product Design Issues (b.2)	0.166	0.064	8
		Maintenance Costs (e.g. minimum balance) (b.3)	0.251	0.097	4
		Lack of support from bank/staff (b.4)	0.133	0.052	10
		Lack of documents (e.g. ID, KYC etc.) (b.5)	0.122	0.047	12
		Low/Irregular Income (b.6)	0.143	0.055	9
Attitude (BA.3)	0.261	Cultural Norms Issues (c.1)	0.196	0.051	11
		Trust Issues (w.r.t formal financial institutions) (c.2)	0.311	0.081	6
		Confidence Issues (c.3)	0.493	0.129	2

Source: Author's Calculation based on AHP technique

A summary of the local and global priority weights calculated using the AHP technique is shown in Table 1.

Among the main dimensions (criteria), Access received the highest priority (0.387), followed by Awareness & Knowledge (0.352) and lastly, Attitude (0.261).

Among the sub-dimensions (sub-criteria) of the Awareness & Knowledge main dimension (BA.1), low financial literacy (0.439) received the highest priority, followed by low digital literacy (0.290) and, lastly, lack of formal education (0.271).

Next, the sub-dimensions (sub-criteria) of the Access (BA.2) parameter were weighed. The results showed maintenance costs (0.251) receiving the highest priority, followed by issues with respect to payment systems (0.185), product design issues (0.166), low/irregular income (0.143), lack of support from bank/staff (0.133) and lastly lack of documents (0.122).

Finally, analysis of the attitude (BA.3) parameter revealed that among the sub-dimensions (sub-criteria), confidence issues (0.493) received the highest priority, followed by trust issues with respect to formal financial institutions (0.311) and lastly, cultural norms issues (0.196).

7.3 Socioeconomic Analysis

7.3.1 Findings based on socioeconomic analysis

A Chi-square test was undertaken to test the association of Digital Financial Inclusion – Barrier level with respect to the socioeconomic and demographic level of customers. Results of the same are shown in Table 2. It revealed that in the case of parameters like gender, age, education, income and SHG membership, significant variability was observed in the Digital Financial Inclusion Barrier level; however, no significant variability was observed with respect to marital status, caste and occupation of the customers.

Table 2. Digital Inclusion Barrier Level with respect to Socioeconomic & Demographic Characteristics

Category	Sub Category	Digital Inclusion - Barrier Level (% within each category)			$\chi 2$ Test Significance	Empirical Conclusion
		Low	Medium	High		
Gender	Males	15.5%	67.6%	16.9%	0.045	Accepted
	Females	9.4%	75.5%	15.1%		
Age (yrs)	< 20	0.0%	0.0%	0.0%	0.041	Accepted
	21 - 40	15.8%	69.3%	14.9%		
	41 - 60	11.4%	70.9%	17.7%		
	60 +	0.0%	50.0%	50.0%		
Marital Status	Married	13.5%	71.3%	15.2%	0.387	Rejected
	Unmarried	16.7%	58.3%	25.0%		
Caste	General	11.7%	71.1%	17.2%	0.768	Rejected
	OBC	20.0%	65.5%	14.5%		
	SC	10.0%	70.0%	20.0%		
	ST	0.0%	100.0%	0.0%		
Education	Upto 10th Class	14.3%	57.1%	28.6%	0.024	Accepted
	12 th Class	5.8%	73.1%	21.2%		
	UG	19.3%	67.0%	13.8%		
	PG	7.4%	77.8%	14.8%		
Occupation	Business	13.5%	68.9%	17.6%	0.130	Rejected
	Govt.	11.9%	69.0%	19.0%		
	Private	23.5%	66.7%	9.8%		
	Self	0.0%	78.6%	21.4%		
Income (Rs - monthly)	0 - 15,000	10.0%	63.3%	26.7%	0.047	Accepted
	15,001 - 30,000	15.3%	68.8%	16.0%		
	30,001 - 45,000	10.0%	85.0%	5.0%		
	45,001 +	0.0%	100.0%	0.0%		
SHG membership	Member	17.5%	68.8%	13.8%	0.031	Accepted
	Non Member	11.3%	70.4%	18.3%		

Source: Primary Survey

7.3.2 Discussion of findings

7.3.2.1 Gender: Chi-square test results, as shown in Table 2, points out significant variability in the Digital Financial Inclusion Barrier level with respect to gender ($p<.05$), thereby rejecting the null hypothesis. Overall, it can be seen that females experience a relatively higher level of barriers compared to males. This is in line with previous studies (Bill & Melinda Gates Foundation, 2019; Kabir & Klugman, 2019), which pointed out that women face demand-side barriers like low literacy level, low digital skills & digital literacy, low household bargaining power, supply-side barriers like the absence of gender-specific policies/products/services etc. Further, the high cost of mobile, internet etc., also acts as a barrier since women earn less than men (Kabir & Klugman, 2019). Additionally, safety concerns (e.g. physical threats and online threats) also create barriers (Kabir & Klugman, 2019).

7.3.2.2 Age: Next, significant variability in the Digital Financial Inclusion Barrier level was observed with respect to the age of customers ($p<.05$), thereby rejecting the null hypothesis. The study finds barriers to digital inclusion are relatively lower in the 21-40 age group, followed by 41-60 years. Further, the barrier level was found to be highest for the 60+ age group.

The G-20 Fukuoka policy priority report (GPFI & OECD, 2019) points out that a) low digital capability, b) low financial literacy, c) cognitive decline, d) physical decline, e) social isolation, f) reliance on family members g) difficulty accessing financial advice etc. as the some of the major barriers leading to financial exclusion among the elderly. Further, barriers in terms of mobile ownership/internet availability etc., also act as barriers (Klapper & Hess, 2019).

7.3.2.3 Education: The study finds significant variability in the Digital Financial Inclusion Barrier level with respect to the education level of customers ($p<.05$), thereby rejecting the null hypothesis. The study finds barriers to digital inclusion are relatively lower in customers with a postgraduate degree and above, followed by customers with an undergraduate degree. Further, the barrier level was found to be highest for customers educated only up to Class 10^{th}.

Kofman and Payne (2021) points out a positive correlation between employment and income level with respect to the educational achievement of women. This is further supported by a World Bank report (Wodon et al., 2018) which shows that the income level of women with at least secondary education is two times that of those without any education. Further, a low level of education/financial knowledge can also make customers susceptible to various types of financial fraud (OECD, 2006). Additionally, as per Cetindamar et al. (2012) and Mzobe (2015), education/schooling plays a pivotal role in terms of the decision to use formal financial institutions.

7.3.2.4 Income: Next, significant variability in the Digital Financial Inclusion Barrier level was observed with respect to the Income level of customers ($p<.05$), thereby rejecting the null hypothesis. The majority of the customers experiencing a high level of barrier in the current study belonged to the lowest monthly income group of Rs. 0 – 15,000 (26.7%), followed by Rs. 15,001 – 30,000 Rs. (16 %).

ITU (2007) report finds low income acting as a barrier in terms of the use of digital technology. Further, Tiwari et al. (2019) find higher disposable income among women can be used for autonomous decision making resulting in higher education. Additionally, studies by Hannig and Jansen (2010) also find a relation between income and financial inclusion.

7.3.2.5 SHG membership**:** Lastly, the study finds significant variability in the Digital Financial Inclusion Barrier level with respect to the SHG membership status of customers ($p<.05$), thereby rejecting the null hypothesis. The study finds a relatively higher level of barrier among non-members (18.3%) compared to SHG members (13.8%).

Ramanathan (n.d.) points out that the SHG movement supported poverty alleviation, women empowerment, improved standard of living, savings level, improved loan repayments etc., among the members.

8. Conclusion

8.1 Summary and Practical Implications of the Study

The findings of the study are expected to provide financial institutions/policymakers/ govt. etc., a solid foundation and source to analyse various barriers affecting digital financial inclusion in the background of Covid 19. The study is particularly relevant as the pace of digitalisation has accelerated following the pandemic, while many vulnerable categories are still left out.

The integrated Delphi – AHP technique in the current study has ranked various barriers with respect to digital inclusion with the support of bank officials. The results prioritised low financial literacy, followed by confidence issues, low digital

literacy etc., as among the major barriers to digital inclusion. This can help decision-makers identify and devise suitable policy measures with respect to the digital inclusion barrier on the basis of their relative importance in the overall ranking.

Next, the study developed a Digital Inclusion Barrier index that classified customers into Low/Medium/High on the basis of their perceived digital inclusion barrier. Financial institutions are expected to make use of the same to test customer satisfaction/performance improvements while designing new products during the current pandemic.

Additionally, the study finds significant variability in the Digital Financial Inclusion Barrier level with respect to gender, age, education, income and SHG membership; however, no significant variability was observed with respect to marital status, caste and occupation of the customers. Further, detailed statistical analysis of socioeconomic and demographic parameters revealed that females, people in the age group (60 +), lower educated category, lower-income groups etc., are facing stronger barriers to digital inclusion compared to others. This can help policymakers to make informed decisions regarding the above vulnerable groups in terms of designing customised products suiting their individual requirements.

8.2 Limitations and Scope for Future Research

The current study takes into consideration only the digital financial inclusion barriers with respect to customers of Public Sector Banks in Kerala. Future studies can expand the scope of the current research by taking into consideration a comparative approach between Scheduled Commercial Banks and fintech companies. Further future studies can expand the scope of the current study by making comparisons among various states/countries across the world.

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Modeling Factors affecting Grocery Retail Store Choice in India Pre and Post-Covid-19 Outbreak

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Abstract

The Covid-19 pandemic outbreak had multi-dimensional impacts on people's daily lives. This work attempts to understand whether urban Indian households' preference for grocery stores changed after the Covid-19 pandemic outbreak and identify the factors influencing grocery store choice pre and post-pandemic outbreak. The work also studied whether households assigned greater importance to supply chain sustainability factors post-pandemic outbreak. The grocery purchase behaviour of urban Indian households was studied through an online survey of 506 households conducted during the initial phase of the pandemic outbreak. The survey questionnaire included socio-demographic, store and sustainability factors and store choice. The store choice determining factors and sustainability-related factors were taken from relevant literature. Store choice models were developed using a discrete choice multinomial logit model to understand the significant determining factors for retail store choice pre and post-pandemic outbreak.

In the pre-pandemic situation, household size, income, discount, product quality, ambience and the relationship with the shopkeeper significantly affected store choice. However, income, discount, store distance, pack size, credit facilities and delivery issues became significant post-pandemic outbreak. The popularity of most preferred local grocers increased post-pandemic outbreak. However, for higher-income customers or those preferring discounts, local store preference decreased, and multiple sourcing increased post-pandemic outbreak. Local store patrons valued relationship, quality and convenient shopping hours. Also, households were observed to be more concerned about food safety and nutrition rather than production method and animal welfare. With multiple ripples of the pandemic and fear of resurgence, the findings of this work will be valuable for designing customer retention strategies for various store formats in India.

Keywords: *Covid-19 pandemic, Grocery store choice, Discrete choice Multinomial Logit Model, Sustainability issues, Food chains*

1. Introduction

The outbreak of the Covid-19 pandemic had multi-dimensional impacts on people's daily lives influenced by the fear of infection and the mandatory requirement of social distancing to contain the spread of infection. People became more aware of the importance of enhancing immunity. Home cooking increased, the preference for ready-to-eat items like frozen dinners decreased, and people became more conscious of food wastage (Dou et al., 2020). Increased emphasis on food safety issues and changing preferences led to changing demand patterns, creating new challenges for food supply chains (Galanakis, 2020).

Moreover, with travel difficulties and grocery stores becoming fully or partially non-operational during the imposed lockdown, people's choice of store for grocery procurement experienced significant changes. In some countries, the demand for online grocery purchases increased post-pandemic outbreak as people shifted from physical purchases. Many researchers aimed to study the store choice behaviour post-pandemic outbreak, but such studies are limited in the Indian context. India, with its diverse population, mainly prefers the physical purchase of groceries. The older population face difficulties in online transactions and purchase. In this setting, the store choice behaviour for Indian customers is likely to differ from other countries. Also, many supermarkets and local grocers started providing home delivery. It has been observed from an earlier study that the availability of delivery facilities influences the grocery purchase behaviour of the urban Indian population (Bandyopadhyaya & Bandyopadhyaya, 2021). It is important to study the store choice behaviour and the factors that affect the same in the new normal scenario in the Indian context. Thus this work attempts to

1. Systematically identify the factors influencing grocery store choice pre and post-pandemic outbreak in Indian cities by studying household grocery purchase behaviour. The set of possible factors considered for analysis is from literature that studies store choice behaviour in different countries at pre and post-pandemic outbreak times.

2. Develop store choice models for pre and post-pandemic outbreak scenarios using discrete choice multinomial logit model (MNL) and provide an in-depth analysis of grocery store choice behaviour for Indian customers.

3. Study whether the importance assigned by urban Indian households to supply chain sustainability factors while purchasing groceries had increased after the outbreak of the pandemic.

The study was done through an online survey using a structured questionnaire. The next section provides the literature review. Section 3 gives the methodology adopted for the study. Section 4 describes the data used for the study. Section 5 describes the analysis and results. Finally, section 6 summarises the major findings and conclusions.

2. Literature Review

The Covid-19 pandemic outbreak affected grocery shopping patterns globally, and researchers started systematically analysing the changes. The current work attempts to study the store choice behaviour pre and post-pandemic outbreak in India. Thus, an attempt has been made to systematically understand the observations of researchers on grocery buying behaviour post-pandemic outbreak in the next sub-section; understand the factors that affect store choice in sub-section 2.2 and the importance given by people to food supply chain sustainability factors in sub-section 2.3.

2.1 Covid-19 Pandemic and Grocery Shopping – Observations from Early Studies

Researchers worldwide observed significant changes in peoples' grocery buying patterns with respect to quantities, frequency of shopping trips and amount spent per purchase occasion (Bandyopadhyaya & Bandyopadhyaya, 2021). Changes were also observed in terms of items bought and the store they purchased from (Goddard, 2020; Li et al., 2020). The primary consideration of cost and health for the choice of food items shifted to quality and health post-pandemic outbreak (Celik & Dane, 2020). Grocery items are commodities that tend to be price inelastic, but in case of a price hike, consumers may go for substitution with alternative items or brands (Cranfield, 2020). It was observed that consumers started relying more on brand names, price, product images and colour-added labels to make food choices as they wanted to spend less time shopping (Martin-Neuninger & Ruby, 2020). Studies in the UK indicated changes in food buying patterns as middle-class households started daily home cooking, and bulk demand for food grains from restaurants shifted to disaggregate domestic demand (Bakalis, 2020; Goddard, 2020).

Researchers in Canada observed an increase in online purchases and a decrease in grocery shopping trips due to

pandemic restrictions and income uncertainties (Goddard, 2020; Cranfield, 2020). Research in China by Li et al. (2020) showed a sharp decline in purchases from farmers' markets and a surge in online and local store purchases. Researchers from France, the UK, China and USA also reported an increase in online grocery shopping (Pantanoa et al., 2020; Nicola et al., 2020). In China and US, small local shops showed a high level of customer retention (Dou et al., 2020; Li et al., 2020). In addition, people in the US who earlier depended on grocery stores started sourcing from farmers who could deliver direct during the pandemic (Worstell, 2020). However, shopping patterns cannot be generalised for all countries due to differences in socio-economic conditions and retail formats availability.

Researchers in the UK, France, Canada and Indonesia observed that retailers started facing new challenges with increased online grocery purchases. Digital innovation became important, including product cataloguing and digital payments capability development. Order size restriction and protecting employee and customer health became important. With the elderly shopping online, retailers must consider their vulnerabilities and health hazards (Pantanoa et al., 2020). To cope with increased demand, some retailers started restricting supply to the elderly and people with disabilities, which decreased satisfaction for other customers (Martin-Neuninger & Ruby, 2020). Long online queues, slow websites and unreliable deliveries also increased dissatisfaction. As service delivery systems changed, retail employees needed to adapt to new roles or suffer layoffs (Nicola et al., 2020; Goddard, 2020; Sudrajat, 2020; Power et al., 2020).

2.2 Factors affecting Choice of Grocery Retail Store

Researchers worldwide attempted to analyse socio-economic and store-related factors influencing grocery store choice. Arnold et al. (1978) compared seven studies analysing factors affecting grocery store choice in USA and Netherlands. They observed that locational convenience was the most important store choice determinant for the USA, whereas, in the Netherlands, the price was the most important. Other important store attributes were assortment, discount and products and services quality. Arnold et al. (1983) found that cleanliness and ambience also influenced store choice. Hutcheson and Moutinho (1998) observed that value for money and quality were greater influencers of store choice than parking availability, easy checkout system, product range and brand. Gehrt and Yan (2004) observed that age, income, occupation, ethnicity and time scarcity of customers, along with availability, product information and comparability, delivery speed and shopping time, affected store choice. Carpenter and Moore (2006) observed that household size, education and income were significant predictors of store choice. Also, Briesch et al. (2009) observed that convenience, price, brand and assortment affected store choice.

Researchers observed that discounting strategy also affected store choice (Gehrt & Yan, 2004). Store image, along with the frequency and magnitude of discounts, affected consumers' value perceptions (Wu et al., 2004). The credibility of price formats also determines customers' store choices (Ho et al., 2011). Reutterer and Teller (2009) found that customers patronise multiple store formats for grocery shopping, preferring large stores for major purchases because of assortment, price and discounts and smaller stores for fill-in trips for convenience.

A study in India observed that store choice depended on proximity and relationship with the retailer but not on ambience or brand spread (Sinha & Banerjee, 2004). Desai and Phadtare (2017) observed that product portfolio, price, proximity, payment convenience and store atmosphere influenced store choice. Goswami and Mishra (2009) observed that organised retailers were preferred for cleanliness, offers and private-label brands, whereas local stores were preferred for proximity and relationship with customers. Grocery store choice for Indian customers was affected by income, age, family size, occupation, education and proximity (Prasad & Aryasri, 2010; 2011). Also, late-hour availability, product variety, brand, home delivery, ambience, discounts and fair prices, food quality and store promotion determine store choice (Goel & Dewan, 2011). Prasad (2016) observed that distance, shopping convenience and availability of fresh goods were important, but credit facilities and relationship with shopkeepers were not important for customers of organised retailers.

Researchers worldwide also studied the popularity of online grocery purchases. A study in the US showed that those with high internet usage still rated traditional retail stores more highly than online retailers (Gehrt & Yan, 2004). Another study of supermarket grocery shoppers in South England showed that customers were reluctant to regularly use the Internet for grocery shopping. The delivery charge, travel time to the physical store, time available for shopping and trip purpose affect online shopping decisions (Huang & Oppewal, 2006). Melis et al. (2015) observed that grocery shopping frequency and spending levels for households using multiple sourcing are lower online than offline. A study of online shoppers in India showed that they are young,

unmarried, educated and of a high-income group and preferred to buy only essential groceries but not fruits and vegetables online (Rao & Moorthy, 2020). A study in nine emerging and developed economies in October 2020 showed that while online purchase frequency increased, the average monthly spending decreased by 11% in the agro-food sector (UNCTAD, 2020).

2.3 Food Supply Chain Sustainability Issues

Social, economic and environmental sustainability issues are important for food supply chains, especially post-pandemic outbreaks (Kumar et al., 2020). Retail stores need to understand the level of awareness and concerns customers have for these issues. Nutritional quality and health effects also affect consumers' choice of food items. During the pandemic, it was observed that customers' buying patterns of food items witnessed changes (Bandyopadhyaya & Bandyopadhyaya, 2021). Customers became more conscious of the food items they buy, especially for international sourcing, and sourcing transparency became an issue. Food safety has become more important to minimise viral contamination between producers, retailers and consumers (Galanakis, 2020). Supply chains must be resilient to absorb such shocks (Bakalis, 2020).

It was observed in earlier studies that the likelihood of occurrence and risk of hazards in food supply chains was becoming important with increased international sourcing and food processing. Customers became concerned about food safety and traceability of the origin (Aung & Chang, 2014; Aruoma, 2006). It has been observed that food labelling specifying the nutritive value, safety and product origin can assure customers of food quality (Wognum et al., 2011; Shamim et al., 2020). Environmental impact reporting of food production and delivery systems became increasingly important as consumers' buying decisions may be influenced by the assurance that environmental norms are not violated. Transparency information, process improvements and branding also became important to ensure that the customers are safeguarded against any hazards. However, whether customers are ready to pay more to get transparency information was not clear (Wognum et al., 2011). Yakovleva (2007) analysed UK food supply chains using the sustainability assessment model to assess social, environmental and economic impacts and considered market concentration, gender balance, wages, employment, energy use, water use and waste. Hampl and Loock (2012) observed that sustainability initiatives strongly influence customers' grocery store choices. Moreover, product-related sustainability measures, namely organic or regional products, were observed to have greater influence than operations-related measures, including the treatment of employees or the use of renewable power.

During the pandemic, food shortages and inequalities challenged the social sustainability that food supply chains aim to achieve. Researchers have observed that this affected both food providers and consumers (Power et al., 2020). Kinsey et al. (2020) observed that low-income households in the US could not afford online or bulk purchases of groceries, nor could they rely on congregate kitchens and had to visit stores multiple times. In China, food availability was not a major issue, but the choice of items decreased, price volatility increased, and community ordering was observed (Dou et al., 2020). Researchers suggested better packaging and clear labelling to reduce food waste. The pandemic led to reduced food wastage and greater attention to expiry dates. Increasing efficiency in the food industry minimised inventories, even for non-perishable items increasing dependency on efficient transportation, which was affected during the pandemic (Jribi et al., 2020; Galanakis, 2020; Bakalis, 2020). Long transportation of staples created significant environmental challenges, and short food supply chains have been suggested (Bakalis, 2020). Liu et al. (2020) found that Chinese customers placed the highest value on government certification and the least on traceability information. A study in the UK observed that just-in-time sourcing policies made supply chains more vulnerable to sudden disruptions (Power et al., 2020). However, self-organised local food supply chains with relatively independent, self-reliant nodes are resilient (Worstell, 2020). Only limited studies are available in the Indian context on food chain sustainability issues.

3. Methodology

This work aims to study the grocery purchase behaviour of urban Indian families in terms of their grocery store choice pre and post-pandemic outbreak, possible changes and factors influencing these changes. A detailed household survey was conducted to obtain grocery store choices pre and post-pandemic outbreak. To understand significant determining factors for store choice, detailed in Table 1, and if these factors changed after the pandemic outbreak, store choice models were developed for store choice pre and post-pandemic outbreak using MNL. This study considered three store choice options: organised physical retailers (supermarkets and hypermarkets), mentioned as supermarkets hereafter, local grocery stores and multiple sourcing (including online purchase), referred to as multiple sourcing hereafter.

Table 2 details the supply chain sustainability factors which were analysed by past researchers.

Table 1. Store Choice Variable Selection

Factors	Country	Reference
Both pre and post-pandemic		
Number of members	USA, India	(Carpenter & Moore, 2006; Prasad & Aryasri, 2010)
Income	USA, India	(Carpenter & Moore, 2006; Gehrt & Yan, 2004; Prasad & Aryasri, 2010)
Discount	USA, Europe	(Wu et al., 2004; Gehrt & Yan, 2004; Goel & Dewan, 2011; Ho, Ganesan, & Oppewal, 2011; Reutterer & Teller, 2009; Desai & Phadtare, 2017)
Distance of store	USA, Europe, India	(Prasad & Aryasri, 2010; Sinha & Banerjee, 2004; Huang & Oppewal, 2006; Goswami & Mishra, 2009; Prasad, 2016)
Hours	Europe, China	(Gehrt & Yan, 2004; Huang & Oppewal, 2006)
Quality	USA, Europe, India, Korea	(Goel & Dewan, 2011; Aung & Chang, 2014)
Availability	India, USA	(Goel & Dewan, 2011; Gehrt & Yan, 2004)
Ease of shopping	USA, Europe, India	(Huang & Oppewal, 2006; Briesch et al., 2009; Prasad, 2016; Desai & Phadtare, 2017)
Store ambience	USA, Europe, India	(Baker et al., 2020; Goel & Dewan, 2011; Sinha & Banerjee, 2004; Goswami & Mishra, 2009; Desai & Phadtare, 2017)
Choice	USA, Europe, India	(Carpenter & Moore, 2006; Briesch et al., 2009; Reutterer & Teller, 2009; Goel & Dewan, 2011)
Relationship with shopkeeper	USA, Europe, India	(Carpenter & Moore, 2006; Sinha & Banerjee, 2004)
Pack size	USA	(Briesch et al., 2009)
Credit	India	(Prasad, 2016)
Home delivery	India	(Goel & Dewan, 2011)
Brand	USA, Europe, India	(Sinha & Banerjee, 2004; Goel & Dewan, 2011; Briesch et al., 2009)
Label	Korea, China, Europe	(Aung & Chang, 2014; Liu et al., 2020; Martin-Neuninger & Ruby, 2020; Wognum et al., 2011)
Only post-pandemic		
Shortage	India	(Goel & Dewan, 2011)
Delivery	USA, India	(Gehrt & Yan, 2004; Goel & Dewan, 2011)

Table 2. Food Supply Chain Sustainability Factors

Factors	Country	Reference
Food safety	Korea, China	(Aung & Chang, 2014; Liu et al, 2020; Wognum et al, 2011)
Nutrition	Korea, Europe	(Aung & Chang, 2014; Yakovleva, 2007)
Local sourcing	Korea	(Aung & Chang, 2014)
Packaging	China	(Wognum et al., 2011)
Production method	China	(Wognum et al., 2011; Aruoma, 2006)
Environmental effect	China, Europe	(Wognum et al., 2011; Yakovleva, 2007; Hamprecht et al., 2005)
Animal welfare	Europe	(Wognum et al., 2011; Yakovleva, 2007)

Source: Prepared by authors

The household survey questionnaire included socio-demographic and store-related factors, store choice outcomes and sustainability factors. The next sub-section gives a theoretical background of MNL.

3.1 Multinomial Logit Model

MNL is used for choice modelling for more than two category choice options (Petrucci, 2009; Wuensch, 2014). The model calibration aims to determine the utility and linear functions of independent variables for each choice option. For example, the utility function for retail choice format may be written as equation 1.

$$U(rf) = \beta_i X_i + \varepsilon_{i,rf} \quad (1)$$

The independent variables, X_i, may be continuous or discrete. The random error term εi, rf is assumed to follow the Gumbel distribution. $U(rf)$ is the utility for any retail format (rf) is organised retailers (1), local grocers (2) and multiple sourcing (3).

The probability of a certain person choosing a particular retail format is proportional to the utility offered by the particular store format for the person. Therefore, the choice probability may be written as equation 2.

$$P(rf = j) = \frac{e^{U_j}}{\sum_{\forall rf} e^{U_j}} \quad (2)$$

Model was calibrated using IBM-SPSS 23.

4. Data

In this study, primary household-level grocery purchase behaviour data pre and post-pandemic outbreak was obtained through an online survey between 26 March and 29 April 2020 during the first wave of the Covid-19 pandemic when India was going through strict lockdown restrictions. The survey was administered to over 1200 families, and 520 responses from 23 Indian states were obtained, of which 506 responses were complete and could be used for analysis.

The sample size of 506 is adequate. The minimum sample size required is 385 from 138 crore population (the current Indian population size), as calculated using equation 3 (Krejcie & Morgan, 1970):

$$S = \chi^2 NP(1-P) \div d^2(N-1) + \chi^2 P(1-P) \quad (3)$$

Where S is the required sample size, 2 is the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841), N is the population size, P is the population proportion (0.5 for maximum sample size), d is the degree of accuracy expressed as a proportion (0.05).

Table 3 gives the demographic profile of respondent households.

It may be observed that preference for supermarkets and multiple sourcing decreased post-pandemic outbreak, and local store patronage, highest even before the pandemic outbreak, increased substantially afterwards.

Table 4 shows the number and percentage of households before and after the outbreak of the pandemic who prefer a particular retail store format for purchasing groceries. It may be observed that preference for supermarkets and multiple sourcing decreased post-pandemic outbreak, and local store patronage, highest even before the pandemic outbreak, increased substantially afterwards.

Table 3. Respondent Household Profile

Description	Data levels	Count (Percent)
Number of members	Nuclear (1-3)	137 (27)
	Midsized (4-6)	288 (57)
	Joint (> 6)	81 (16)
Monthly Income	Low (L): < Rs.25,000	65 (13.10)
	Middle (M): Rs.25,000-50,000	109 (21.98)
	Upper middle (UM): Rs.50,000-100,000	145 (29.23)
	High (H): > Rs.100,0000	177 (35.69)

Source: Prepared by authors

Respondents were also asked to indicate the importance they assigned to store-related factors (detailed in Table 1) pre and post-pandemic outbreak. Also, they were asked to indicate whether they considered the food supply chain sustainability factors (detailed in Table 2) with greater importance while purchasing groceries after the pandemic outbreak. A brief description of the factors used in the pre and post-pandemic outbreak store choice models is given in Table 5.

5. Analysis and Results

This study aims to understand if the choice of retail store changed after the outbreak of the pandemic and the factors that affected store choice before and after the pandemic outbreak. The next subsection presents the pre and post-pandemic outbreak store choice models and their comparative analysis. Finally, subsection 5.2 presents the results from the analysis of the changing importance of food supply chain sustainability factors post-pandemic outbreak.

Table 4. Store Choice Pre and Post-Pandemic Outbreak

Grocery Store option	Code	Pre-pandemic	Post-pandemic
		Count (Percent)	Count (Percent)
Supermarkets	1	132 (26.1)	42 (8.3)
Local grocery store	2	247 (48.8)	377 (74.5)
Multiple sources	3	127 (25.1)	87 (17.2)
Total		506 (100)	506 (100)

Source: Prepared by authors

Table 5. Data as Used in MNL Models

Factors	Abbreviation	Type	Levels
Both Pre and post-pandemic outbreak			
Number of Members	N_Mem	Ordered Categorical	L =1; M=2; UM=3; H=4
Household Income	Incom	Categorical	Important = 1; Not Important = 0
Discount	Disc		
Distance of store	Dist		
Convenient hours	Hrs		
Quality of goods	Qlty		
Availability	Avail		
Ease of shopping	Ease		
Store ambience	Amb		
Choice of products	Choice		
Relationship with shopkeeper	Rel		
Package sizes	PackSize		
Credit facilities	Credit		
Home delivery	HomDel		
Brand name	Brand		
Food labeling	Label		
Post-pandemic outbreak only			
Experienced shortage	Shortage	Categorical	Yes = 1; No = 0
Experienced delivery problems	Delivery		

5.1 Grocery Store Choice Models

Two separate grocery store choice models for choice of store for household grocery purchases were developed for pre and post-pandemic outbreak situations for Indian households using MNL. The three competing grocery store choices considered for the study were supermarkets, local stores and multiple sourcing.

The pre-pandemic model considered two demographic factors, namely the number of members in the household and income, and fourteen store-related factors, namely Discount, Distance of store, Convenient hours, Quality of goods, Availability, Ease of shopping, Store ambience, Choice of products, Relationship with shopkeeper, Package sizes, Credit facilities, Home delivery, Brand name and Food labelling for predicting store choice behaviour as described in Table 5. The post-pandemic outbreak store choice model considered two additional factors, namely Shortage (whether people have experienced a shortage of grocery items they wanted to buy at stores) and Delivery (whether people were facing issues of reliable delivery) for predicting store choice behaviour. The next sub-section details the pre and post-pandemic store choice models. Subsection 5.1.3 provides a comparative analysis of the two models.

5.1.1 Pre-Pandemic Grocery Store Choice Model

The pre-pandemic store choice model was calibrated with household survey data. Table 6 shows the model fit information.

Table 6 shows that the final model is significant compared to the intercept-only model. Pearson chi-square and deviance statistics assess the goodness of fit of the model. Here non-significance indicates that the final model adequately duplicates the observed frequencies at various levels of the outcome. The pseudo-R-square values obtained may be considered satisfactory (Smith & Cornelius, 2013). Table 7 shows the significance of factors affecting store choice before the pandemic outbreak using Likelihood ratio tests.

In Table 7, the chi-square statistic represents the difference between the log-likelihood of the intercept-only model (reduced model) and the final model (model considering the factor and intercept). The significance shows the significance of the factor in the model. It may be observed that before the outbreak of the pandemic, the two demographic factors, i.e. number of members in the family and income, significantly affected the choice of retail store. Also, discounts offered by the store significantly affected retailer choice. The quality of products, the ambience of the store and the relationship with the shopkeeper, are also significant factors. The remaining factors were not found to significantly affect store choice.

Table 8 shows the parameter estimates for the choice of supermarkets and local grocery stores separately in comparison to multiple sourcing (3.0), the reference category, pre-pandemic outbreak.

Table 6. Pre-Pandemic Store Choice Model Fit

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	973.501			
Final	868.416	105.084	32	.000
	Goodness-of-Fit			
	Chi-Square	df	Sig.	
Pearson	863.852	818	.129	
Deviance	819.532	818	.478	
	Pseudo R-Square			
Cox and Snell			.191	
Nagelkerke			.218	
McFadden			.101	

Source: Prepared by authors using IBM SPSS Statistics V23

Table 7. Likelihood Ratio Tests:
Retailer Choice Pre-Pandemic Outbreak Factors

Effect	Likelihood Ratio Tests				
	Log Likelihood	Chi-Square	df	Significance	
Intercept (Reduced Model)	868.416[a]	.000	0	.	
N_Mem	889.693	21.277	2	.000	*
Incom	884.473	16.057		.000	*
Disc	879.461	11.044		.004	*
Dist	872.225	3.809		.149	
Hrs	868.943	.526		.769	
Qlty	876.352	7.935		.019	**
Avail	869.796	1.379		.502	
Ease	869.179	.762		.683	
Amb	881.488	13.071		.001	*
Choice	869.756	1.340		.512	
Rel	888.338	19.921		.000	*
PackSize	870.214	1.798		.407	
Credit	868.998	.581		.748	
HomDel	871.780	3.364		.186	
Brand	870.453	2.037		.361	
Label	870.064	1.648		.439	

*Significant at: * 99%; ** 95%; *** 90%*

Source: Prepared by authors using IBM SPSS Statistics v23

It may be observed from Table 8 that for supermarkets, the intercept β value is -15.71 showing that there are significantly fewer odds of choosing supermarkets compared to multiple sourcing for the average Indian population. Also, the relationship with shopkeepers significantly affects the choice of supermarkets compared to multiple sourcing. The negative slope shows that if the relationship is more valued, the odds of choosing supermarkets decreases compared to multiple sourcing. The other factors are not significant.

The odds of choosing a local store are positive over multiple sourcing, as observed from the intercept. It may also be observed that the number of members in the household is a significant factor and has a positive slope, indicating that as the number of members increases in households, the odds of choosing local grocery stores are higher over multiple sourcing. Income is also a significant explanatory factor, and a negative slope indicates that as income increases, the odds of choosing local stores decrease compared to multiple sourcing. Discount is also significant, and the negative slope shows that when discounts become more important, the odds of choosing local stores decrease compared to multiple sourcing. This may be possible as people may switch part of their grocery purchases to other retail formats like supermarkets or online because of greater discounts offered. Quality is a significant factor, with a positive slope showing that when people are more concerned about quality, their chances of choosing local grocery stores are higher than multiple sourcing. The ambience is another significant factor with a negative slope showing that if people give greater importance to store ambience, their odds of choosing local grocery stores decrease compared to multiple sourcing. Relationship with shopkeepers is also significant, and a positive slope indicates that when the relationship is valued, the odds of choosing local grocery stores increase compared to multiple sourcing. Home delivery, another significant factor, has a negative slope indicating that increased preference for home delivery causes people to prefer multiple sourcing of groceries rather than purchasing from local grocers. This may be because the local grocers do not have the manpower to give free home delivery services.

Table 8. Pre-Pandemic Store Choice Model Parameter Estimates

Ret_BN	Variables	Estimates (β)	Std. Error	df	Significance	Exp(β)	
Supermarkets 1.0	Intercept	-15.71	1.316	1	0		
	N_Mem	0.012	0.06		0.837	1.012	
	Incom	0.039	0.135		0.771	1.04	
	Disc	-0.2	0.373		0.591	0.819	
	Dist	-0.14	0.341		0.682	0.87	
	Hrs	-0.012	0.432		0.978	0.988	
	Qlty	16.061	0		.	9446812.52	
	Avail	0.301	1.09		0.782	1.351	
	Ease	-0.462	0.617		0.454	0.63	
	Amb	0.29	0.309		0.348	1.337	
	Choice	-0.564	0.626		0.367	0.569	
	Rel	-0.495	0.282		0.078	0.609	***
	PackSize	0.39	0.311		0.21	1.477	
	Credit	0.038	0.299		0.899	1.039	
	HomDel	-0.374	0.277		0.177	0.688	
	Brand	0.439	0.409		0.284	1.551	
	Label	0.166	0.423		0.694	1.181	
Local Stores 2.0	Intercept	0.192	1.117	1	0.864		
	N_Mem	0.179	0.053		0.001	1.196	*
	Incom	-0.363	0.118		0.002	0.695	*
	Disc	-0.957	0.33		0.004	0.384	*
	Dist	0.472	0.342		0.168	1.603	
	Hrs	-0.237	0.388		0.542	0.789	
	Qlty	1.827	0.987		0.064	6.215	***
	Avail	-0.581	0.839		0.489	0.559	
	Ease	-0.46	0.583		0.43	0.631	
	Amb	-0.653	0.274		0.017	0.521	**
	Choice	-0.598	0.555		0.281	0.55	
	Rel	0.673	0.277		0.015	1.959	**
	PackSize	0.309	0.283		0.275	1.363	
	Credit	0.191	0.274		0.484	1.211	
	HomDel	-0.452	0.255		0.077	0.636	***
	Brand	0.511	0.375		0.173	1.667	
	Label	0.494	0.395		0.211	1.639	

*Significant at: * 99%; ** 95%; *** 90%*

Note: For categorical variables, Not Important is considered as base variable, β estimates presented are comparative change in influence when variables changes from Not important (Base) to important

Source: Prepared by authors using IBM SPSS Statistics V23

5.2.2 Post-Pandemic Grocery Store Choice Model

The post-pandemic store choice model was calibrated with household survey data. Table 9 shows the model fit information for the post-pandemic outbreak store choice model.

Table 9 shows that the final model fits significantly compared to the intercept-only model. Pearson and Deviance Goodness of fit indicates that the final model adequately duplicates the observed frequencies at various outcome levels. Pseudo R-square values are also acceptable.

Table 10 shows the significance of factors affecting store choice post-pandemic outbreak.

Table 9. Post-Pandemic Store Choice Model Fit

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	711.612			
Final	654.132	57.480	36	.013
	Goodness-of-Fit			
	Chi-Square	df	Sig.	
Pearson	939.972	930	.403	
Deviance	651.124	930	1.000	
	Pseudo R-Square			
Cox and Snell		.109		
Nagelkerke		.143		
McFadden		.080		

Source: Prepared by authors using IBM SPSS Statistics V23

Table 10. Likelihood Ratio Tests: Factors Affecting Store Choice Post-Pandemic Outbreak

Effect	**Likelihood Ratio Tests**				
	Log Likelihood	Chi-Square	Df	Sig.	
Intercept	654.132[a]	.000	0	.	
N_Mem	654.644	.512	2	.774	
Incom	664.095	9.962		.007	*
Disc	658.760	4.627		.099	***
Dist	659.586	5.453		.065	***
Hrs	657.531	3.399		.183	
Qlty	655.954	1.822		.402	
Avail	654.524	.392		.822	
Ease	658.259	4.126		.127	
Amb	655.705	1.573		.456	
Choice	654.618	.486		.784	
Rel	655.217	1.084		.582	
PackSize	659.043	4.910		.086	***
Credit	661.683	7.550		.023	**
HomDel	657.751	3.619		.164	
Brand	654.879	.746		.689	
Label	655.868	1.736		.420	
Shortage	658.138	4.006		.135	
Delivery	662.445	8.313		.016	**

*Significant at: * 99%; ** 95%; *** 90%*

Source: Prepared by authors using IBM SPSS Statistics V23

Table 10 shows that income is a significant explanatory factor that affects store choice post-pandemic outbreak, but the number of family members does not influence store choice. Discounts offered by the store, the distance of the store and pack size significantly affect retailer choice. Credit facilities and delivery were also found to be significant. The remaining factors, namely convenient shopping hours, quality, availability, ease of shopping, ambience, choice of products available, and brand and food labelling, were not found to significantly affect the store choice after the pandemic outbreak. Table 11 shows the parameter estimates for the choice of supermarkets and local grocery stores separately compared to multiple sourcing (3.0), the reference category, post-pandemic outbreak.

Table 11. Post-Pandemic Store Choice Model Parameter Estimates

Ret_AN[a]		B	Std. Error	Df	Significance	Exp(β)	
1	Intercept	-3.364	1.626	1	0.039		**
	N_Mem	0.006	0.073		0.938	1.006	
	Incom	0.158	0.215		0.462	1.171	
	Disc	-0.86	0.552		0.119	0.423	
	Dist	-1.117	0.519		0.031	0.327	**
	Hrs	0.48	0.511		0.348	1.616	
	Qlty	1.078	1.172		0.358	2.939	
	Avail	0.66	1.152		0.567	1.934	
	Ease	1	0.54		0.064	2.719	***
	Amb	-0.164	0.471		0.728	0.849	
	Choice	-0.129	0.498		0.796	0.879	
	Rel	0.007	0.488		0.988	1.007	
	PackSize	0.979	0.477		0.04	2.662	**
	Credit	-1.223	0.574		0.033	0.294	**
	HomDel	0.173	0.435		0.692	1.188	
	Brand	-0.441	0.559		0.43	0.643	
	Label	0.753	0.62		0.225	2.124	
	Shortage	0.792	0.511		0.121	2.208	
	Delivery	-1.031	0.471		0.029	0.357	**
2	Intercept	2.13	0.668	1	0.001		*
	N_Mem	0.029	0.045		0.523	1.029	
	Incom	-0.283	0.126		0.024	0.753	**
	Disc	-0.65	0.318		0.041	0.522	**
	Dist	-0.087	0.325		0.788	0.917	
	Hrs	0.585	0.317		0.065	1.795	***
	Qlty	-0.195	0.471		0.679	0.823	
	Avail	0.039	0.471		0.934	1.04	
	Ease	0.082	0.315		0.795	1.085	
	Amb	-0.364	0.3		0.225	0.695	
	Choice	-0.213	0.309		0.491	0.808	
	Rel	0.272	0.301		0.365	1.313	
	PackSize	0.124	0.301		0.679	1.132	
	Credit	0.095	0.321		0.767	1.1	
	HomDel	-0.371	0.258		0.15	0.69	
	Brand	-0.019	0.337		0.955	0.981	
	Label	0.355	0.357		0.321	1.426	
	Shortage	-0.085	0.292		0.771	0.919	
	Delivery	0.163	0.307		0.595	1.177	

*Significant at: * 99%; ** 95%; *** 90%*
Source: Prepared by authors using IBM SPSS Statistics V23

Table 11 shows that for supermarkets, the intercept β is -3.36, indicating that there are fewer odds of choosing supermarkets compared to multiple sourcing for the average Indian population post-pandemic outbreak. Distance of store significantly affects the choice of supermarkets compared to multiple sourcing. The negative slope shows that if the distance of supermarket store is more, the odds of choosing supermarkets decreased compared to multiple sourcing. Those who gave importance to the availability of required pack size preferred supermarkets over multiple sourcing. However, those who valued credit facilities preferred multiple sourcing over supermarkets. Ease of shopping was also a significant factor, with a positive slope indicating that supermarkets were preferred over multiple sourcing when people considered ease of shopping important. Finally, delivery issues were significant, and the negative slope indicates that when people faced delivery concerns, the odds of sourcing groceries from supermarkets decreased compared to multiple sourcing.

Considering the comparison of local grocery stores with multiple sourcing, it may be observed that the intercept is highly significant. The positive value indicates that the odds were in favour of local grocery stores compared to multiple sourcing for the average Indian population after the outbreak of the pandemic. Income was significant, and the negative slope indicates that the odds of choosing local grocery stores were lower for higher-income households. The discount was significant, with a negative slope showing that when discounts were preferred, the odds of choosing local grocery stores decreased compared to multiple sourcing. Convenient hours for shopping was also significant, with a positive slope indicating that the odds were in favour of local grocery stores compared to multiple sourcing when convenient shopping hours were considered important. Finally, shortage and delivery issues were not significant when comparing local grocery stores and multiple sourcing.

The next sub-section provides a summary and comparative analysis of the results obtained from the store choice models developed.

5.2.3 Comparison of Pre and Post-pandemic Outbreak Grocery Store Choice Models

The pre and post-pandemic outbreak grocery store choice models revealed several interesting observations. First, it could be observed from the likelihood ratio tests that the two demographic factors, namely the number of members in the household and income, significantly affected grocery store choice in the pre-pandemic situations. However, after the pandemic outbreak, only income remained significant. Discounts offered by the store significantly affected retailer choice both before and after the pandemic outbreak. The ambience of stores, product quality and relationship with shopkeepers, which were significant store choice determining factors pre-pandemic outbreak, did not remain significant afterwards. Additional factors namely distance of the store, pack size and credit facilities, which were not significant earlier, became significant post-pandemic outbreak. Out of the two additional factors considered for the post-pandemic outbreak store choice model, namely shortage and delivery issues, only delivery issues were observed to significantly determine store choice. It is interesting to note that shortages resulting from supply disruptions influenced stockpiling tendency of households (Bandyopadhyaya & Bandyopadhyaya, 2021) but not store choice.

The parameter estimates of pre and post-pandemic outbreak MNL models enable detailed comparison of the preferences of customers for the three types of grocery retail store formats, namely supermarkets, local grocers and multiple sourcing. It could be observed that supermarkets were less preferred and local stores more preferred compared to multiple sourcing before the pandemic outbreak. In the post-pandemic outbreak, supermarket preference improved but was still less compared to multiple sourcing. Local stores were preferred much more than before compared to multiple sourcing. In comparing supermarkets and multiple sourcing, only the relationship with shopkeepers was significant pre-pandemic outbreak. If relationships were more valued, the odds of choosing supermarkets decreased significantly. During the post-pandemic outbreak, distance, pack size, credit, delivery and ease of shopping became significant for customers when they compared supermarkets and multiple sourcing. For those giving importance to distance, credit and delivery preferred multiple sourcing over supermarkets. However, if ease of shopping and pack sizes were important, the odds of choosing supermarkets increased significantly over multiple sourcing.

When comparing local stores and multiple sourcing, it could be observed that family size, income, discounts, quality, ambience, relationship with shopkeepers and home delivery were significant. As family size increased, the odds of choosing local stores increased but with an increase in income; local stores were less preferred. Also, when people were more concerned about quality or relationships with shopkeepers, they preferred local stores. However, when discounts, ambience or home delivery were important,

multiple sourcing was preferred over local stores. Post-pandemic outbreak- income, discount and convenient shopping hours were significant for comparing local stores and multiple sources. As in the pre-pandemic situation, the odds of choosing local stores decreased for higher-income customers or those assigning greater importance to discounts. However, local stores were preferred if convenient shopping hours were considered important.

5.3 Importance of Food Supply Chain Sustainability Factors

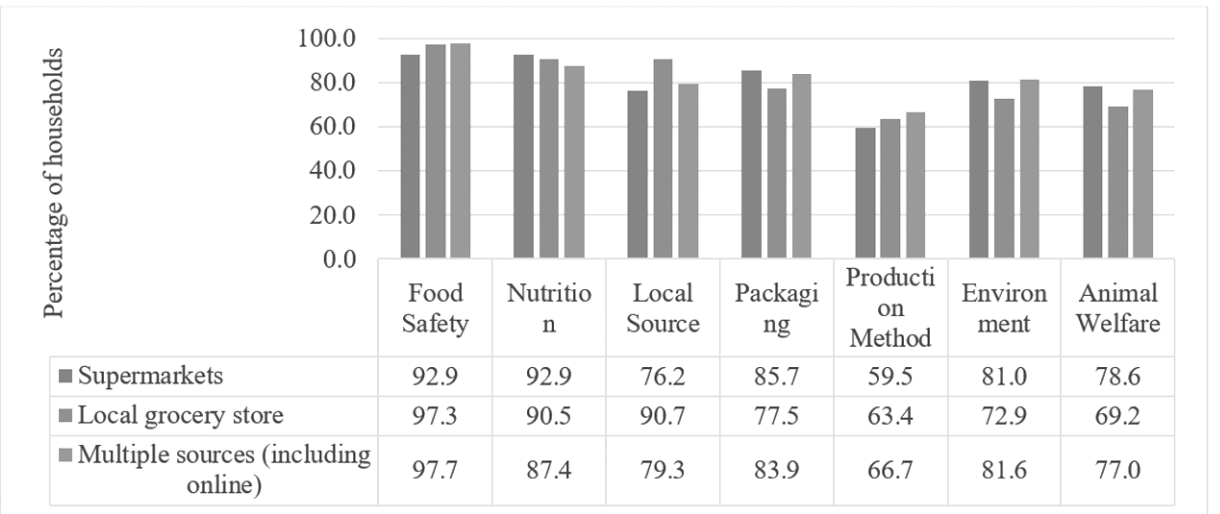
An attempt was made to understand whether households assigned greater importance while purchasing their groceries post-pandemic outbreak to supply chain sustainability factors, namely, food safety, nutrition, local sourcing, packaging, production method, environmental effect and animal welfare. Figure 1 shows the store format-wise proportion of households that assigned greater importance to these factors.

Figure 1 shows that the maximum proportion of households gave greater importance to food safety and nutrition, while the least proportion assigned greater importance to the production method. A similar trend was observed in a study done in pre-pandemic settings (Hampl & Loock, 2012). Households which procured groceries from local grocery stores post-pandemic gave greater importance to local sourcing and least importance to packaging compared to those procuring from other store formats.

6. Conclusions

This work attempted to understand the possible changes in grocery store preference of Indian households post-pandemic outbreak and the factors that affect grocery store choice pre and post-pandemic outbreak by developing store choice models. Moreover, it attempted to understand whether concerns for food supply chain sustainability factors increased post-pandemic outbreak. Data was collected from 506 households through an online survey conducted during the initial phase of the Covid-19 outbreak.

It could be observed that local stores, the most preferred store format for grocery shoppers in India, became even more preferred after the pandemic outbreak. However, it could be observed that higher-income households preferred multiple sourcing of groceries compared to purchasing from local stores. To target this section of customers, local grocery stores may think of providing offerings that customers perceive to be of value, like home delivery. But this will increase their cost unless customers are ready to pay for the delivery. While comparing supermarkets with multiple sourcing, it could be observed that post-pandemic outbreak, supermarkets were not preferred by those customers who gave importance to distance, credit and delivery services. Online retailers provide delivery services, and local grocers have the advantage of nearness to customers. Also, local grocers often provide credit facilities. As the ambience of the store did not remain a significant store-determining factor after the pandemic outbreak, the competition is expected to be tougher for supermarkets. With multiple ripples of the pandemic and fear of resurgence, the findings of this work



	Food Safety	Nutrition	Local Source	Packaging	Production Method	Environment	Animal Welfare
Supermarkets	92.9	92.9	76.2	85.7	59.5	81.0	78.6
Local grocery store	97.3	90.5	90.7	77.5	63.4	72.9	69.2
Multiple sources (including online)	97.7	87.4	79.3	83.9	66.7	81.6	77.0

Source: Prepared by authors

Figure 1. Households assigning greater importance to sustainability factors

will be valuable for designing customer retention strategies for various grocery retail store formats in India.

Also, improved facilities may be designed for customers to facilitate their grocery purchases. As this work was done in the initial phase of the pandemic outbreak, further work may be done in future to understand if the changes in preference that could be observed in this study are long-term. Some factors, like sanitisation of stores and adherence to Covid-19 protocols, may be included as store choice determinants in later studies.

Limited work was possible for sustainability issues in the supply chain. However, some interesting points could be noted. People had increasing concerns about food safety and nutrition-related issues. Local sourcing was comparatively more important for those procuring from local grocers. Method of production and animal welfare are still not considered important by a large proportion of Indian households. This indicates requirement of further detailed work in the area as sustainability issues are likely to become more important and may even affect customers' choice of retail stores in the coming days.

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Behavioural Bias: Does it Affect an Investor's Rationality?

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Abstract

The stock market is a crucial aspect of India's financial market and the world's economy, which results in massive investment performances. In the fast-moving financial scenario, traditional finance is incapable of explaining the irrationality of an investor. The investors are irrational and get influenced by irregularities in the financial market. Behavioural finance has received a lot of significance through its endeavours to ascertain the biases behind an investor's behaviour. This research paper aims to examine the significant impact of behavioural biases on the investment decision-making of individual investors. The study consisted of 378 individual investors trading in Indian stock exchanges, and data was gathered with the help of a questionnaire developed for the purpose of research. The questionnaire was empirically tested after approving its reliability and validity. The results revealed a substantial impact of the behavioural biases affecting the investment decisions of the individual investors: Loss aversion bias, Status quo bias and Optimism bias in the presence of gender as a moderator. The results also exhibited that Loss Aversion bias had the maximum impact on the investment decision-making of an Indian individual investor.

Keywords: *Behavioural finance, Behavioural bias, Emotional bias, Individual investor, gender*

1. Introduction

The state-of-the-art advancements in the expanse of finance and related markets emphasise the divergences between conventional and modern (related to behaviour) finance. Standard finance posits the rationality of individuals, organisations, and markets while they take their financial decisions (Hunguru et al., 2020; Baker & Filbeck, 2013). On the contrary, behavioural finance confronts the notion of prudence and proposes that investors tend to vary from opting for ideal monetary decisions to be taken and do not take impeccable decisions (Riaz et al., 2020; Tourani-Rad & Kirkby, 2005). Theories associated with traditional finance considered the markets exceedingly efficient and the investors to be decidedly logical (Sattar et al., 2020). On the other hand, the modern-day market clearly observes that each investor who invests in the market is not extremely efficient or rational in the financial decisions taken; rather, they are affected by inefficiencies. These inefficiencies of financial markets have always been the region of concern and the centre of attraction because many irregularities continue to exist without being answered. These irregularities or irrationalities arrive or appear since every investor is human and not a calculating machine. So, being human, even financial decisions are impacted by emotions (Brooks et al., 2022). The studies in the past have reflected on the relationship between emotional biases and investment (Novianggi & Asandimitra, 2019; Azouzi & Anis, 2012); however, the distinct effect of various emotional biases on individual investors in India is required to be further examined.

Through this article, we propose that the following irregularities require to be answered:

- Do investors really make rational decisions?
- What are the reasons behind the irrational decision-making of investors?
- How do the anomalies affect the investment decision-making of investors?
- How do the different behavioural biases affect individual investors in their decision-making process?

The answer to the questions mentioned above lies in understanding investor psychology, which has steered the expansion of behavioural finance. The existence of perfect markets was discussed in the early 1980s in the area of economics and finance; however, it does not really exist in the actual stock markets. Further, it was perceived that even the financial markets are inefficient (Fama, 2021; Yoong & Ferreira, 2013; Shiller, 2003). By the end of the late 1980s and the beginning of the 1990s, behavioural finance sought the answer to this dilemma. Veni and Kandregula (2020) explicate the origin and foundation of behavioural finance based on psychology, finance and sociology. This novel finance stream was developed to examine an investor's behavioural aspects while participating in financial markets (Antony, 2020). Behavioural finance has countered and clarified the minutiae behind behavioural changes of the investors, which leads to the deviation from judicious decision-making (Shah et al., 2018). It challenges the "theory of rational investors" in addition to the "efficiency of the markets". Kahneman and Tversky (1979) authored the article "Prospect theory: An analysis of decision under risk". It was exceptionally appreciated as a fragment of this innovative arena of behavioural finance and contributed to the intensification of the concept of prospect theory, which explains the risk-affected decision-making of investors based on the probabilistic alternatives (Kahneman & Tversky, 2013). Behavioural anomalies demonstrated by individual investors (Sharma et al., 2021) can hinder making the best use of resources to maximise their wealth. Such anomalies in financial decision-making are known as biases.

Behavioural finance postulates that human beings use a variety of shortcuts and filters while making economic decisions. The human brain is not a machine and doesn't parallel a computer's functioning. Instead, the human brain uses various irrational processes in order to make decisions under conditions of uncertainty. These processes lead to many decision mistakes. These mistakes are systematic and can be predicted. They are prevalent not only among individual investors but also among managers and institutional investors. These suboptimal financial decisions adversely affect the productivity of money markets, own wealth, and the healthy functioning of enterprises. Many crashes and bubbles, which continue to occur in the financial markets around the world from time to time, validate the presence of emotional and behavioural factors that impact a person's decision-making in financial matters.

2. Literature Review

2.1 Behavioural Biases and Investors

Financial academicians and behavioural practitioners identified several behavioural biases which are associated with investors (Sachdeva et al., 2022). Many investors are vulnerable to behavioural biases existing in the process of investment-related choices (Bhatia et al., 2020). Biases

commonly play a role in being the driving factor behind the anomalies, as investors are psychological beings occupied with complex emotions (Quaicoe & Eleke-Aboagye, 2021). In order to understand an individual's investment decisions, there is an utmost need to recognise different behavioural biases tangled in their decision-making process (Sahi et al., 2013). Over the last twenty years, the use of the behavioural approach in explaining stock price movements has been mounting (Corredor et al., 2015; Kaplanski & Levy, 2010; Edmans et al., 2007). Lim and Brooks (2012) and Chen et al. (2004) observed that irrationality in financial markets was displayed due to behavioural biases (Yusuf & Makina, 2022), leading to inadequate investment decisions of individual investors. Extant literature in the past suggests that cognitive biases have been studied to an extended level in the past (Money illusion bias: Darriet et al., 2020; Confirmation bias: Rollwage et al., 2020; Self-attribution Bias: Hsu et al., 2021; Conservatism Bias: Rahim et al., 2019; Gambler's fallacy bias: Gubaydullina & Spiwoks, 2015; Representativeness bias: Baker et al., 2018; Anchoring bias: Madaan & Singh, 2019; Illusion of control bias: Hsu et al., 2020; Herding bias: Devadas & Vijayakumar, 2019; Mental Accounting bias: Baker et al., 2018; Framing bias: Beratšová et al., 2018; Disposition effect bias: Salazar & Agudelo, 2020; House money bias: Duxbury et al., 2015; Familiarity bias: Alrabadi et al., 2018; Home bias: Zahera & Bansal, 2018; Recency bias: Ma et al., 2014; Overconfidence bias: Mushinda, 2019; Self-control bias: Kishor, 2020; Media response bias: Khilar & Singh, 2019.) However, if this situation is to be compared with emotional biases, there is a dearth of literature (Kishor, 2022) where loss aversion bias, status quo bias and optimist bias has received the least emphasis in the past. Therefore, these biases are the focus area of the current article. A detailed description of the following three emotional behavioural biases is mentioned below:

2.3.1 Loss aversion bias

The concept of loss aversion bias was coined by Kahneman and Tversky (1979). Investors react differently to losses and profits (Koszegi & Rabin, 2006). Some individuals overreact when they incur a loss; hence, they focus more on avoiding losses than observing profits (Ainia & Lutfi, 2019). This bias leads to investors sticking to unprofitable investment avenues (Akinkoye & Bankole, 2020). Investors inclined towards loss aversion bias are concerned regarding the losses suffered (Rashata, 2022) and, at times, even avoid investments (Khan, 2017). Investors are subjected to loss aversion bias when decisions are about investments (Bashir et al., 2013). The researchers concluded that there was a significant impact of loss aversion on investment decisions (Areiqat et al., 2019). Loss aversion bias affects different investors differently when making financial decisions (Gachter et al., 2021). Rostami and Dehaghani (2015) supported a significant association between loss-aversion bias and investment. Researchers exhibit a significant positive level of the relationship existing between loss aversion bias and investment decisions (Sukanya & Thimmarayappa, 2015; Subash, 2012).

H1a: Loss Aversion Bias (LA) affects the investment decision of Indian individual investors.

2.3.2 Optimism bias

Optimism can be defined as the overestimation of the occurrence of positive events (Hennefield & Markson, 2022) and undermining the probability of bad events (Marwan & Sedeek, 2018). Many investors are likely to look at the financial market situations with unnecessary optimism. Many investors are overly optimistic (Beaudry & Willems, 2022), thinking that bad investments won't happen to them (Banerji et al., 2020); it will only bother others. As a result, investors tend to be excessively positive regarding the financial system and its pleasant performance. Optimism bias influences investment decisions (Brahmana et al., 2012). The moderate occurrence of optimism bias is found to positively impact investors while they make investment decision-making (Akinkoye & Bankole, 2020). Abreu and Mendes (2020) found a positive effect of optimism bias on investment trading and decision-making.

H1b: Status Quo Bias (SQB) affects the investment decision of individual Indian investors.

2.3.3 Status Quo Bias

Samuelson and Zeckhauser (1988) underlined the presence of status quo bias in investment decision-making. In case of this bias, investors prefer to continue the existing investment situation (Hofmann, 2022) and avoid making changes in their portfolios (Banerji et al., 2020). Investors realise the difficulty in taking financial decisions and decide to put them on hold (Filiz et al., 2018). Many investors try to trade securities for higher yields but cannot accomplish them due to stagnant portfolios (Brown & Kagel, 2009). This bias influences an investor's financial decisions (Filiz et al., 2018). Male investors exhibit less status quo bias than their female counterparts (Tekçe & Yılmaz, 2016). Researchers have also emphasised no significant relationship between status quo bias and investment decision-making (Akinkoye & Bankole, 2020).

H1c: Optimism Bias (OP) affects the investment decision of Indian individual investors.

2.2 Gender and Investor's Traits

Researchers in the past (Hasnawati & Ernie, 2022; Parveen et al., 2021; Alrabadi et al., 2018; Baker et al., 2018; Bashir et al., 2013 among others) have discovered that an investor's demographic profile and behavioural biases are adversely associated with investment decisions. Cronqvist and Siegel (2014) opined that investors contrast significantly in terms of their investment decisions. Gender influences an investor's attitude and preference towards risk, eventually affecting their financial investments (Hsu et al., 2021). Men are open to risk-taking and thus are less risk averse than the opposite gender (Meyll & Pauls, 2019). Females are more risk-averse than males (Singh et al., 2021). However, men also exhibit a higher level of optimism when compared with their counterparts (Foo et al., 2020; Baker et al., 2019). On the other hand, women show greater signs of loss aversion bias (Mahapatra & Mehta, 2015). Furthermore, it was found that gender interacts with behavioural financial factors in investment decisions (Laryea & Owusu, 2022; Nurbarani & Soepriyanto, 2022; Rekik & Boujelbene, 2013). Research has also emphasised that no significant effect of gender has been found among investors (Onsomu, 2014).

There is a paucity of literature in the past which would explore investment decisions taken by an individual investor in the existence of behaviour and an investor's gender. But, as far as the author knows, this is the first endeavour which studies the situation of Indian individual investors on important aspects of behavioural biases, namely, Loss aversion bias, Optimism bias and Status- quo bias.

Hypothesis based on gender as moderator:

H4: Gender moderates the relationship between Loss Aversion bias and investor's Investment Decision.

H5: Gender moderates the relationship between Status Quo bias and investor's Investment Decision.

H6: Gender moderates the relationship between Optimism bias and investor's Investment Decision.

3. Development of the Conceptual Framework and Hypotheses Formulation

The researcher proposes a conceptual model based on the extant literature to determine the effect of different behavioural biases on the investment decision process made by individual investors in the presence of gender as a moderator. Investment decision-making is a dependent variable and the three biases studied, namely, loss aversion bias, status quo bias and optimism bias are the independent variables, where gender plays the role of a moderator. Figure 1 illustrates the developed conceptual framework.

Studies theorise the effect of emotional biases on investment decision-making. Loss Aversion bias has been studied by various authors, including (Areiqat et al., 2019; Baker et al., 2019) in the past. Akinkoye and Bankole (2020) opined on the measurement of status quo bias, and Pompian (2011, 2006) worked on optimism bias. In addition, several authors have proposed investment decision-making from time to time (Ogunlusi & Obademi, 2019; Nyamute, 2016; Pasewark & Riley, 2010; Qureshi, 2012). A detailed description of the constructs used in the event of all the dependent and independent variables used in the study is given in Table 1.

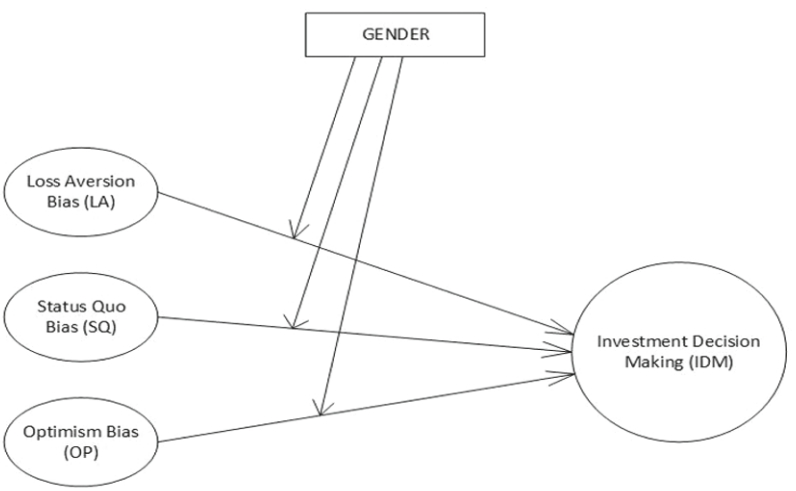

Figure 1. Proposed Conceptual Framework

4. Research Methodology

4.1 Questionnaire Development

The form was designed based on the factors discovered in the literature analysis on subjects of demographic variables, behavioural bias and investment decision process related to individual investors of India. Based on the literature review, sixteen sub-factors have been identified which impact an Indian investor's investment decision. These sixteen sub-factors are categorised into four main factors (Loss aversion bias, Optimism bias, Status quo bias and Investment decision-making). Professionals from both industry and academics were approached to confirm the validity check of the questionnaire. Based on the feedback received by the experts, ambiguous terms and complex sentences were modified in the final questionnaire. The detailed description of constructs, along with variables used in the preparation of the instrument, is mentioned in Table 1.

The questionnaire designed comprises multiple parts. Section A defines the demographic details (age, gender, occupation, income, city/ state, trading experience etc.). Section B emphasises questions in the area of investor behaviour using a five-point Likert scale where 1 refers to Strongly disagree and ranges to 5, where 5 refers to Strongly agree. The questions in this section were linked to loss aversion bias, optimism bias and status quo bias. Finally, section C elucidates investors' behaviour while taking investment-associated decisions using a five-point Likert scale.

4.2 Sample and Data Collection

The targeted population/ universe for the current article encompasses individual investors trading in the Indian stock market. The primary data of individual investors were collected through the registered stock brokers spread across different cities of the country from August 2021 to January 2022. The purposive sampling technique was used to select respondents from each city and district. A total of 408 respondents were contacted to fill out the required questionnaire. The final responses taken into the study were 378, excluding 30 responses which were eliminated due to non-submission of responses, missing values, or inappropriate details. The ten times rule (Hair et al., 2016) was applied, which indicates that the sample size should be equal to the larger of ten times the largest number of formative indicators used to measure a single construct or ten times the largest number of structural paths directed at a particular construct in the structural model. The total variables used in the study were 16, so any sample size of 160 (16*10) or more was appropriate. We tried to gather the maximum amount of data in the available time span. The gathered data is analysed with the help of Statistical Package for Social Sciences (SPSS) version 23.0.

5. Data Analysis and Findings

5.1 Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) has been used with the objective of dimension reduction. The extraction is done through Principal Component Analysis.

The rotation method used is Varimax with Kaiser Normalization, and rotation has been converged in 5 iterations. It is clear from the data that all the required items have been appropriately loaded (as shown in Table 2 and Table 3).

Table 1. Constructs and Variables

Constructs	Variable	References
Loss Aversion bias	Loss and gain on stock, engagement in risk, rate of return on investment, nervousness over price drop, market performance, loss of capital	Areiqat et al., 2019; Baker et al., 2019; Jain et al., 2019; Alrabadi et al., 2018; Usman, 2018.
Status Quo bias	Standard mix of investment, rate of return, satisfaction over investment	Akinkoye & Bankole (2020); Alrabadi et al., 2018; Pompian, 2006.
Optimism bias	Optimism, investment opportunities, earnings, confidence of investor	Pompian 2011; Pompian, 2006.
Investment Decision making	Degree of safety, interest payments, principal repayment, degree of risk, revenue growth, societal benefit, cash flow, risk association, long-term yield, financial knowledge, risk involvement.	Ogunlusi & Obademi, 2019; Nyamute, 2016; Pasewark & Riley, 2010; Qureshi, 2012.

5.2 Confirmatory Factor Analysis (CFA)

In the proposed model of individual investors' investment decision-making, the decision-making construct is established by the constructs of loss aversion bias, optimism bias and status quo bias. Before continuing to the model testing step, it is essential to measure the convergent validity, discriminant validity and reliability of the model with the sustenance of Confirmatory Factor Analysis (Hair et al., 2016). To examine different validities, there is a requirement to realise the values of various fit indices so that they meet the required conditions. Table 4 shows the obtained values of various fit indices along with the requisite limits. As can be seen from Table 4, all the values of fitness indices meet the minimum criteria. Therefore, it is concluded that the model is robust from the different parameters studied.

Table 2. Assumptions of EFA

Assumptions of EFA	Conditions	Reference: (Chopra et al. 2019)	Assumptions
Sample size is 378	*n>200*	Kyriazos (2018)	Met
Barlett's test of sphericity is significant	$p < 0.001$	Field (2013)	Met
KMO value is 0.873 measure of sampling adequacy	> 0.70	Hutcheson & Sofroniou (1999)	Met
Satisfactory communalities values	> 0.50	Field (2013)	Met
Total variance explained is 76.245%	> 50%	Podsakoff & Organ (1986)	Met
The variance for the first factor is 20.951%	< 50%	Podsakoff & Organ (1986)	Met

Table 3. Rotated Component Matrix

	Component			
	1	2	3	4
LA1				.795
LA2				.806
LA3				.782
LA4				.773
SQ1	.918			
SQ2	.918			
SQ3	.894			
SQ4	.902			
OP1		.871		
OP2		.884		
OP3		.894		
OP4		.884		
IDM1			.794	
IDM2			.807	
IDM3			.804	
IDM4			.795	
Total Variance explained (Cumulative %)	20.951	40.761	58.719	76.245

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

5.3 Convergent Validity (CV) and Discriminant Validity (DV)

For different constructs, Composite Reliability needs to be greater than 0.7 (Hair et al., 2016; Kline, 2011), and Average Variance Extracted (AVE) is required to be more than 0.5, while the required value of Maximum Shared Variance (MSV) is lesser than the value of AVE for fulfilling the criteria of Convergent Validity (Hair et al., 2016). As shown in Table 5, the CR, AVE and MSV values meet the threshold limits; therefore, it endorses the convergent validity of the constructs mentioned in this study. From Table 6, we can validate the discriminant validity of constructs used in the study.

Table 4. Goodness of Fit Indices

Fit Index	Limit	Values in Present Study	References (Hooper, 2008)	Acceptability
		Absolute Fit Indices		
χ^2		116.59		
df		98		
p value	>0.05	0.097		Yes
χ^2 / df	1.00-5.00	1.19	Kline (2010)	Yes
RMR	<0.08	0.024	Hu and Bentler (1999)	Yes
GFI	>0.90	0.963	Jöreskog and Sörbom (1993)	Yes
AGFI	>0.80	0.949	Jöreskog and Sörbom (1993)	Yes
		Relative Fit Indices		
NFI	>0.80	0.971	Bentler and G. Bonnet (1980)	Yes
PNFI	>0.50	0.793	Bentler and G. Bonnet (1980)	Yes
IFI	>0.90	0.995	Bollen (1990)	Yes
TLI	>0.90	0.994	Tucker and Lewis (1973)	Yes
		Noncentrality- based indices		
CFI	>0.90	0.995	Byrne (2010)	Yes
PGFI	>0.50	0.694	James et al. (1982)	Yes
RMSEA	<0.08	0.022	Steiger (1990)	Yes

Table 5. Convergent Validity Parameters

ITEMS	CONSTRUCT	FACTOR LOADING		CR	AVE	MSV
LA1	<--- LA	0.769				
LA2	<--- LA	0.788	**LA**	0.850	0.587	0.486
LA3	<--- LA	0.75				
LA4	<--- LA	0.756				
SQ1	<--- SQ	0.896				
SQ2	<--- SQ	0.909	**SQ**	0.935	0.783	0.033
SQ3	<--- SQ	0.852				
SQ4	<--- SQ	0.881				
OP1	<--- OP	0.822				
OP2	<--- OP	0.86	**OP**	0.911	0.720	0.033
OP3	<--- OP	0.872				
OP4	<--- OP	0.839				
IDM1	<--- IDM	0.822				
IDM2	<--- IDM	0.807	**IDM**	0.874	0.634	0.486
IDM3	<--- IDM	0.783				
IDM4	<--- IDM	0.771				

Table 6. Discriminant Validity

	OP	**LA**	**SQ**	**IDM**
OP	**0.848**			
LA	0.075	**0.766**		
SQ	0.182	-0.081	**0.885**	
IDM	0.147	0.697	-0.174	**0.796**

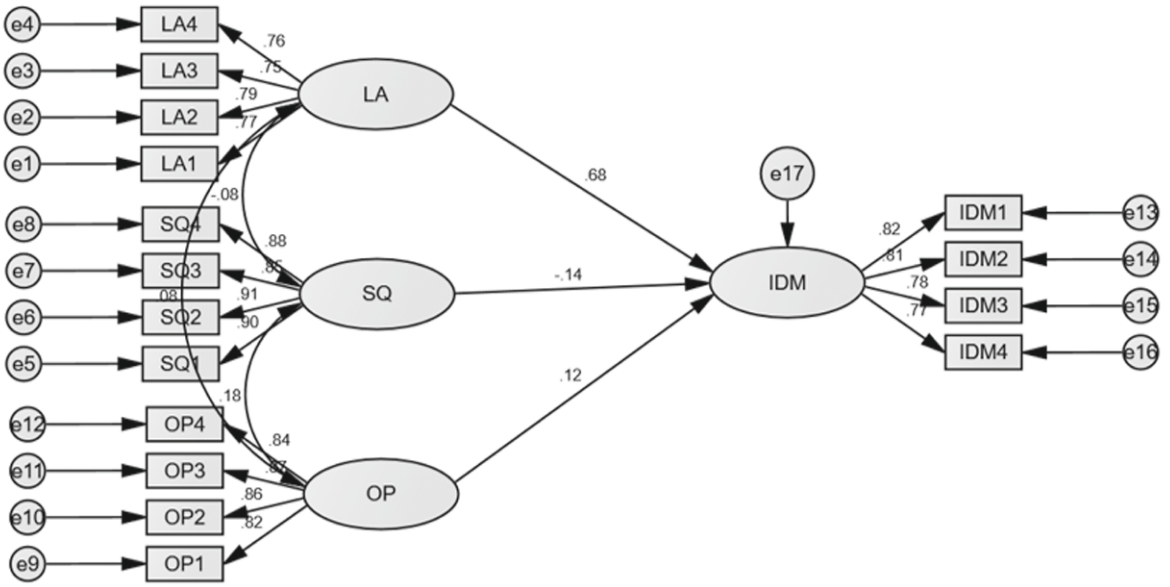

Figure 2. Structural model by AMOS 21

CHI SQUARE= 116.590; DF=98; CFI= 0.995; RMSEA= 0.022.

5.4 Measurement Model

Following the validation of Convergent Validity (CV) and Discriminant Validity (DV), path analysis is carried out on AMOS, projecting the regression values of the relations appearing in Figure 2.

5.5 Path Analysis (Multigroup Moderation) - Moderating effect of Gender

For investigating the model fit, the relative Chi-square index (CMIN/DF), Goodness-Of-Fit Index (GFI), Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA) were considered. The results of the above-mentioned texts were: 1.19; 0.963; 0.995, and 0.022, respectively. Behavioural biases have significance in the investment decision, and it was determined for a sample of different genders (male v/s female). Table 3 shows the calculation of standardised regression coefficients with the associated level of significance.

6. Findings and Discussion

Table 7 shows that Loss Aversion bias significantly affects the investment decision-making of individual investors (β = 0.676, p-value = 0.000). This leads to acceptance of the first alternative hypothesis at a 99% level of significance. From Table 8, it is also concluded that gender is significantly moderating (z score = 3.967 > 2.58) the relationship between loss aversion and investment decision-making at a 99% level of significance. Males are more prone to loss aversion bias than their female counterparts. (Female: β = -0.025, p value = 0.000; Male: β = 0.51, p value = 0.000). This finding is supported by Akinkoye and Bankol (2020), Areiqat et al. (2019) and Baker et al. (2019).

Status Quo significantly affects the investment DM of individual investors (β = -0.141, p-value = 0.002). This leads to acceptance of the second alternative hypothesis at a 95% level of significance. The negative value of status quo bias implies a negative relationship of status quo bias with investment decision-making, which means maintaining a status quo by an investor leading to less investment made. From Table 8, it is concluded that gender is significantly moderating (z score = -2.086 < -1.96) the relationship between status quo and investment decision-making at a 95% level of significance. Males are more prone to status quo bias in comparison to their female counterparts. (Female: β = -0.025, p value = 0.000; Male: β = -0.092, p value = 0.000). This is supported by studies in the past (Gubaydullina et al., 2011; Kempf & Ruenzi, 2006).

Table 7. Results of Hypothesis.

		Estimate	S.E.	C.R.	P Leval
IDM	<---LA	0.676	0.053	11.211	***
IDM	<---SQ	-0.141	0.033	-3.038	0.002
IDM	<---OP	0.122	0.039	2.597	0.009

Table 8. Role of Gender as a Moderator

			FEMALES			MALES			Z- SCORE
			Estimate	S.E.	P	Estimate	S.E.	P	
IDM	<- --	LA	0.323	0.037	***	0.51	0.029	***	3.967
IDM	<- --	SQ	-0.025	0.016	0.115	-0.092	0.028	***	-2.086
IDM	<- --	OP	0.076	0.019	***	0.034	0.033	0.314	-1.119

Optimism bias significantly affects the investment decision-making of an individual investor ($\beta = 0.122$, p-value = 0.009). This leads to acceptance of the third alternative hypothesis at a 95% level of significance. From Table 8 mentioned below, it is concluded that gender is not moderating (z score = -1.119 > -1.96) the relationship between optimism bias and investment decision-making at a 95% level of significance. Males are more prone to optimism bias in comparison to their female counterparts. (Female: β = 0.076, p value = 0.000; Male: $\beta = 0.034$, p value = 0.000). Peña & Mejía (2019) and Pompian (2011) have previously supported similar findings.

7. Conclusion

Despite the extensive literature on behavioural finance, restricted academic studies have attempted to elucidate the link between gender and behavioural bias, particularly in India (Sharma et al., 2021; Prosad et al., 2015). This article tries to add to the behavioural finance literature by filling this gap. Indian economy remains one of the fast-growing economies in the world, and the strength and competence of Indian financial markets offer an appealing prospect of investment to investors. However, financial controllers and policy regulators are anxious regarding the behavioural leanings of Indian investors. The study investigates the presence of behavioural bias among investors with the help of 378 respondents. The analysis discovers that various behavioural biases, including loss aversion bias, status quo bias and optimism bias, are present when an investor decides on financial investment. Therefore, this research's finding supports the irrationality among investors and explains that personal sentiments are strongly correlated with investment decision-making.

On the basis of values calculated of different behavioural biases, out of loss aversion bias, status quo bias and optimism bias, status quo bias appears to be the most prominent bias exhibited by the sample of individual investors with a value of 0.885, followed by optimism bias (0.848) and loss aversion bias (0.766)

Studies suggest that gender is a vital demographic variable influencing the investment patterns of investors in India (Chavali & Mohanraj, 2016). The relationship between loss aversion bias and investment decision-making is significantly affected by gender as a moderator. Also, the relationship between status quo bias and investment decision-making is significantly affected by gender as a moderator. This is in accordance with the findings of Jamil and Khan (2016) and Albaity et al. (2012). However, the relationship between optimism bias and investment decision-making is not affected by gender as a moderator. In general, the findings confirm that Indian investors are susceptible to distinctive behavioural bias and demographic variables have an association with them.

7.1 Implications

The findings of our study have significant implications for developing enhanced and rational investment decision-making. Moreover, investment strategies to be developed may be based on the biases undertaken in the study. The findings are crucial not just for research scholars or academicians but also to financial experts, practitioners and decision makers as the empirical studies show irrationality in investment decisions. The study has further inferences for financial educationalists in proposing awareness plans. The counsellors can be further effective in their services by knowing the prevailing behavioural biases while the client takes financial decisions related to short and long time investments. Society, in general, can reap the benefits of the understanding offered in this study by improving financial education, resulting in financial well-being.

7.2 Future Scope

Researchers in future can undertake studies on an extended sample base of individual investors in India. Further, variables apart from gender, like trading experience, nationality, religion, or income, could be used, and an analysis of their association with investors' financial behaviour could be studied.

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Customer Satisfaction and Shopper Value: Exploring Demographic Variables in an Online Environment

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Abstract

The paper aims to determine the relationship between Shopper Value, Customer Satisfaction and Customer Online Purchase Engagement (COPE) in the Indian online retail environment. This study also examines the role of demographic variables and their impact on Hedonic and Utilitarian Shopper Values. Karl Pearson correlation and ANOVA were used to analyze the data collected from 340 respondents on satisfaction and shopper value variables. Subsequently, Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) were used to test the conjectured paths. The findings showed that both hedonic and utilitarian values significantly influence customer satisfaction. The study also revealed that the young shoppers were driven more by hedonic values compared to the older shoppers, and middle-aged shoppers are more influenced by utilitarian values than young shoppers. Hedonic values mattered more to women compared to men. Utilitarian values were more preferred by men compared to women. Income level was not found to be significant. The study also concluded that by enhancing shopper values, one could enhance customer satisfaction and, in turn, increase customer engagement in the online environment. The finding will help online retail practitioners to understand the role of hedonic and utilitarian values in customer satisfaction, customer engagement and their relationship with demographic variables.

Keywords: *Online Retailing, Shopper Value, Customer Satisfaction, Customer Online Purchase Engagement, Demographic Variables*

1. Introduction

Customer satisfaction has been studied in literature with respect to many constructs like service quality, product quality, shopper value etc. With the advent of online retailing, the importance of service quality and shopper value is increasing. Over the years, online platforms have become aggregators of online retailing, and they must provide the desired shopping experience and satisfaction to customers (Forrester, 2016). Satisfaction in an online setting can be because of superior service encounters and the process of service delivery (Cho & Park, 2001).

Shoppers evaluate the product and the service during the purchase and also after purchase, and their judgment regarding the evaluation can lead to customer satisfaction (Selnes, 1993). Customer satisfaction is also linked to the value they derive from the product and service. Such perceived value by the shoppers can be in the form of product quality, service quality, experience, ambience or price they pay for it (Cottet et al., 2006). Customer satisfaction has many antecedents and can be influenced by the value customers perceive from a product or service (Herman, 2014). Shopper value can be explained in many ways, but one of the prominent ways of explaining shopper value is through hedonism (hedonic value) and utilitarianism (Utilitarian value). Shoppers look for the product's price and the functional utility they derive from its purchase and usage. At the same time, shoppers evaluate their purchase experience in terms of the pleasure or hedonic value they derive (Babin et al., 1994).

Online retailing in India has been growing due to the penetration of mobile and cheaper internet services (International Telecommunication Union, 2017). With the increase in internet users, online retailers and platforms are trying to persuade shoppers online as it provides a convenient and affordable alternative. But such growth has also created competition, so building shopper satisfaction and creating the right experience and value has become critical. Such customer satisfaction can result from an excellent shopping experience or from shopper value (Kim & Stoel, 2004). Considering the literature background, our paper explores whether customer satisfaction and shopper value are related. Past research suggests that demographic variables like age (Det et al., 2017), gender (Jackson, 2011), and income (Allard et al., 2009) impact how customers perceive value and the role of value in customer satisfaction (Kautish et al., 2021). Hence, this study also explores various demographic variables like age, gender, and income and their relation with the two types of shopper values: Hedonic and Utilitarian. Furthermore, online retailers have been investing in quality technology infrastructure to provide better navigation and user interface to shoppers to enhance their engagement with the platform or the retailer (Swar & Panda, 2021). Hence this paper also evaluates the role of shopper values in enhancing customer satisfaction and, in turn, influencing 'Customer Online Purchase Engagement' (COPE).

The paper has been organized in the following ways: - we started with an introduction by providing a background of the study. The second part explained the review of literature related to shopper value, customer satisfaction, online purchase engagement and their relationship. We then identified the objectives and formulated hypotheses and the research methodology adopted in the study. The subsequent section deals with research results and discussions. Finally, we conclude by identifying implications, limitations and scope for further research directions.

2. Literature Review

2.1 Shopper Value

Tauber, in 1972 conducted a study to explore different motives behind shopping behaviour, and identified that shoppers look for satisfaction during their shopping process. Customer satisfaction can be understood by studying what shoppers value. Babin et al. (1994) defined shopping value as hedonic and utilitarian.

Hedonic values mostly deal with the emotional and psychological process during the purchase decision (Babin et al., 1994). Customers derive hedonic value from fun, excitement, and enjoyment during the purchase process. In contrast, Utilitarian value refers to the consumer experience in terms of satisfying the need for the product or service purchased (Belk, 1979; Fischer & Arnold, 1990). Past research suggests that utilitarian and hedonic values are critical to enhancing the shopping experience (Belk, 1979; Fischer & Arnold, 1990; Sherry, 1990). Utilitarian value can be measured to quickly find the product on the retail shelf, while hedonic value can be out of the process of creating shopping excitement. While shopping, consumers expect both hedonic and utilitarian value to be present in the retail store (Jason et al., 2005).

2.2 Customer Satisfaction

The positive post-consumption judgment of customers towards products or services can lead to customer satisfaction (Jamal & Naser, 2002). In service sectors, it can be seen from two different perspectives; disconfirmation and

perception (Davis & Heineke, 1998). There can be a difference in the expectation of the consumers and the perception of the actual performance when the customer shops or uses the product. Such disconfirmation may lead to customer dissatisfaction (Parasuraman et al., 1994; Oliver, 1981). Many researchers found that financial performance or value perception can impact customer satisfaction (Wiele et al., 2002; Yeung et al., 2002; Anderson et al., 1994). Johnston (1997) found that in the retail banking sector, there are three important factors for customer satisfaction: commitment, attentiveness/help, friendliness and care.

Szymanski and Hise's (2000) explained online satisfaction as an overall factor reflecting the total effect of a set of discrete experiences with the service provider over a period of time. As such, customer satisfaction in the online platform can also be measured as the extent to which a customer is both satisfied/dissatisfied and pleased/displeased. Customer satisfaction has been discussed widely in the literature (Oliver, 1981; Anderson et al., 1994), but exploring dimensions in an online setting is at a promising stage (Heiner et al., 2004).

2.3 Customer Satisfaction and Shopper Value

In an online apparel set-up, Kautishet al. (2021) revealed the importance of hedonic and utilitarian value on customer satisfaction. Subsequently, customer satisfaction can also positively affect repeat purchase intents. In a similar study, Vieira et al. (2018), explored the relationship between shopper satisfaction and shopper value. In addition, some studies compared the relative importance of hedonism and utilitarianism while influencing shopper behaviour (Chi & Jyh, 2017). Finally, Ghali et al. (2020) studied the willingness to pay and shopper value in a developing country context. For this purpose, they surveyed 467 Tunisian consumers and proposed that consumer willingness to buy is influenced more by hedonic values compared to utilitarian.

Parker and Wenyu (2019) surveyed 403 Chinese consumers and explored their motivation for different types of shopper values. Such studies also delved into demographic variables to explore their role in shopping motivations and shopper values. A specific study on impulse purchases also showed the positive role of hedonic value among young shoppers (Dipanjan & Ankur, 2017).

Rezaei et al. (2016) studied unplanned purchases and explored the role of shopper value. Loureiro et al. (2014) indicated the strong role of satisfaction and perceived value in a Portuguese supermarket context. Palazon and Delgado-Ballester (2013) analyzed what type of premium, hedonic or utilitarian, is favoured during the promotion. They found that hedonic premiums are preferable to utilitarian ones during promotion.

Olsen and Skallerud (2011) examined Norwegian city grocery shoppers' beliefs about store attributes and revealed that store attributes are negatively related to utilitarian value but positively related to hedonic value. Ryu et al. (2010) conducted a survey to understand the role of shopper values and satisfaction in restaurants in the USA. Their findings indicated that customer satisfaction gets influenced by both types of shopper values though the extent differed. The utilitarian value showed a greater influence on customer satisfaction.

Liu et al. (2008) identified factors that influence Chinese customers' online shopping satisfaction and suggested eight factors that influence online customer satisfaction. Rintamäki et al. (2006) analyzed 364 shoppers from Finland and broke down customer perceived value into multiple groups, including hedonic and utilitarian. Their research found no significant difference between hedonic and utilitarian values in a retail context. Finally, Zhang et al. (2006) examined various factors and related personal characteristics that influence customer satisfaction in an online environment.

2.4 Demographic Variables and Shopper Value

Age and Shoppers Value: Nejati and Moghaddam (2012) showed that in the case of young Iranian consumers, age significantly affects shoppers' value. Wang et al. (2000) found that hedonic and utilitarian values don't similarly impact young consumers in China. Dey and Srivastava (2017) surveyed 333 youngsters aged 15 to 23 and found that youngsters are positively associated with hedonic shopping value.

Income and Shopper Value: Allard et al. (2009) indicated that consumers with low-income levels tend to appreciate the entertainment elements of shoppers' value, i.e. hedonic while shopping in a mall, while the utilitarian elements influenced the high-income groups. Williams (2002) found that low-income levels significantly influenced utilitarian value.

Gender and Shopper Value: Jackson et al. (2011) showed that female shoppers derive more hedonic benefits while shopping in a mall, and the store ambience impacts female customers more than male customers. Sramova and Pavelka (2019) conducted a survey among Slovak boys and girls and

revealed that there was more impact of utilitarian values with respect to online shopping on boys. But in the case of hedonistic value motivations, it was the same for both boys and girls. Williams (2002) found that women generally attach more importance to utilitarian values while shopping. Finally, Emmanuel-Stephen and Gbadamosi (2022) interviewed Black African women in the U.K. and revealed that the respondents' motivation for luxury consumption is driven by hedonism.

2.5 Customer Satisfaction and Customer Engagement

Customer satisfaction leads to higher customer engagement (Pansari & Kumar, 2017). Higgins and Scholer (2009) highlighted that satisfaction is a necessary condition for engagement. Dovaliene et al. (2015) also found customer satisfaction as one of the key drivers of customer engagement. Most of the studies are conducted in the offline format by looking into customer satisfaction, customer engagement and their relationship. It has been observed that in the online shopping environment, shopper value and customer experience play a critical role in customer satisfaction (Hwang & Seo, 2016), and their impact on customer engagement needs further study. So to fill the gap, the present study measures the impact of customer satisfaction on Customer Online Purchase Engagement (COPE). This is needed as online retailers can enhance purchase engagement by improving shopper value and customer satisfaction.

3. Need of the Study

Literature showed that there are different ways of looking at value and shopper motives to buy a product: motives can be product or experiential (Dawson et al., 1990), value can be utilitarian or hedonic (Babin et al., 1994), extrinsic or intrinsic (Lotz et al., 1999) etc. Such papers mostly dealt with offline retail formats and the western retail environment. However, such empirical studies are scarce in online retail settings in India. Moreover, research combining shopper value, customer satisfaction and customer engagement are needed in online formats in India to evaluate the role of shopper values. Hence, the current study explores the correlation between shopper value and customer satisfaction in the online retail environment and the impact of demographic variables on shopper value, especially in the Indian context. This paper also explores the relationship between Shopper Value, Customer Satisfaction and Customer Online Purchase Engagement (COPE).

4. Purpose of the Study

1. To study literature to explore the relationship between shopper value and customer satisfaction and measure the correlation between these constructs.
2. To study Age, Gender and Income as demographic variables and to understand the extent of their influence on shopper values.
3. To empirically test the relationship between Shopper Value, Customer Satisfaction and Customer Online Purchase Engagement (COPE)

5. Research Hypotheses

Past literature suggests that the disposition of a shopper to different shopper values can vary based on demographic characteristics like age, gender and income (Dawson et al., 1990). Hence the current research, in addition to the relationship between customer satisfaction and shopper value, explores the role of demographic characteristics in determining the importance of the two types of shopper values.

5.1 Age

A study on Chinese customers indicated that hedonic and utilitarian values don't have a similar impact on young consumers (Wang et al., 2000). Our proposition is to understand the relationship between age and shopping values in online formats in the Indian retail environment. Thus, our hypothesis is:-

H1: Age has a significant influence on the choice of shopper value.

5.2 Income

Allard et al. (2009) suggested that consumers with low-income levels tend to appreciate the entertainment attributes, i.e. hedonic while shopping in the mall, while the utilitarian attributes influenced the high-income groups. Our proposition is to explore the relationship between income and shopping values in online formats. Thus, the hypothesis is: -

H2: Income has a significant influence on the choice of shopper value.

5.3 Gender

Jackson et al. (2011) examined the impact of gender on shopping values. The results showed that females derive more hedonic benefits while shopping in the mall, and the

store ambience has more impact on female customers. Hence, we propose to understand the role of gender and shopping values in online formats. Thus, our hypothesis is: -

H3: Gender has a significant influence on the choice of shopper value.

The shopper value under consideration in this research is grouped under hedonic and utilitarian values. In store-based purchases, it has been observed that customer satisfaction is one of the antecedents to customer engagement. Hence this research proposes that customer satisfaction may also lead to higher customer engagement in an online environment.

H4: Hedonic Value leads to Customer Satisfaction in the online environment

H5: Utilitarian Value leads to Customer Satisfaction in the online environment

H6: Customer Satisfaction leads to higher Customer Online Purchase Engagement (COPE).

6. Research Methodology

For this research, we have used the existing popular scales on shopping value (Babin et al., 1994) and customer satisfaction (Oliver & Swan, 1989; Maxham & Netemeyer, 2002). In addition, we have altered the Customer Brand Engagement Scale (Obilo et al., 2021) to suit the online environment to measure Customer Online Purchase Engagement (COPE). The scales were subsequently modified to make them more relevant to the Indian online context (Table 1). The responses were collected from 400 customers on a five-point Likert scale in the city of Bhubaneswar, India. Sixty responses were rejected for inconsistency and the final analysis considered 340 responses. The questionnaire also captured the respondents' demographic data required for the analysis. The analysis was done on SPSS and AMOS using statistical applications like Correlation, ANOVA, Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). ANOVA helped compare the means of the data collected for age (three groups: Young, Middle-aged and Old) and Income (Low, Middle and High).

Table 1. Modified Scale

Modified Scale for Variables under Shopping Value (Hedonic)
HV1 – I had fun while shopping online
HV2 – I visit online platforms even if I don't have to buy a product
HV3 – I felt energized and liberated while shopping online
HV4 – I enjoyed the time spent navigating the products online
HV5 – I looked for new products for fun
HV6 – Online shopping was enjoyable because of the experience, not just for the products I purchased
HV7 – I could take decisions fast, and that made me happy
HV8 – Shopping online was exciting
HV9 – It made me forget my problems when I shopped online
HV10 – While shopping, I felt a sense of adventure
Modified Scale for Variables under Shopping Value (Utilitarian)
UV1 –Online shopping felt like accomplishing a task that I wanted to
UV2 –The items needed for my purchase basket were available online
UV3 – The platform/website was helpful in finding the items I needed
Customer Satisfaction
CS1 - Shopping for services/products from the online store or platform is a good idea
CS2 - I am pleased with the online shopping experience
CS3 - I liked purchasing products from the online Platform or store
CS4 - I am happy and satisfied with the overall experience of shopping Online
Customer Online Purchase Engagement (COPE)
COPE 1 - I think about the online platform/store while using products purchased online
COPE 2 - I feel very positive when I shop online from the platform/store
COPE 3 - I enjoy spending time purchasing online from the Platform/store
COPE 4 - I feel good when I purchase products online

7. Results and Discussion

Both the shopper values (hedonic and utilitarian) had a positive and significant correlation with satisfaction. With a correlation coefficient value of .542, the hedonic value is more correlated to customer satisfaction compared to the Utilitarian. This suggests that shoppers in online retail are looking forward to fun and enjoyment while searching for products, which may positively influence customer satisfaction.

To analyze the differences in demographic variables and their role in shopper value influence, we conducted ANOVA. The male respondents gave higher scores to utilitarian values than hedonic (Table 3). Across age groups, shoppers gave more importance to hedonic values than utilitarian though the extent differed. Even low-income groups gave higher responses for hedonic. These may be the young consumers with low income, but their preference for hedonic value is more than utilitarian.

Further in the paper, both the types' values were compared for their role across age, gender and income levels. Young and old age shoppers differed in their perceptions of Hedonic values, whereas the old and middle-aged shoppers differed in their responses to utilitarian values. There was no significant difference between the young and the middle-aged customers for both types of values (Tables 4 and 5). Regarding gender, the difference in value perception for both hedonic and utilitarian value was noticed across male and female customers (Tables 6 and 7). Hence, hypotheses 1 and 2 were accepted for age and gender groups. Across income groups, the ANOVA analysis suggested that they don't differ significantly in their perception of hedonic and utilitarian values (Table 8 and 9). Thus, we rejected hypothesis 3 for income groups.

Table 2. Customer Satisfaction, Hedonic Value and Utilitarian Value: Pearson Correlation Coefficient

		Customer Satisfaction
Shopping value(Hedonic)	Correlation coefficient (Pearson)	0.542
	P	.004
Shopping	Correlation coefficient(Pearson)	0.461
Value(Utilitarian)	*P*	.032

***Source**: Primary data. Both values are significant at a 5% level*

Table 3. Hedonic and Utilitarian Values across Gender, Age and Income

	Gender		Age			Income		
	Gender-Male	**Gender-Female**	**Young**	**Middle aged**	**Old age**	**Low**	**Middle**	**High**
Preferred Shopper value for the group	Utilitarian	Hedonic	Hedonic	Hedonic	Hedonic	Hedonic	Utilitarian	Hedonic
Differences across groups	Both Values			Both values		No significant difference		

***Source**: Primary data*

Table 4. ANOVA- Age Groups

		Sum of Squares	Df	Mean Square	F	Sig.
HVM	Between Groups	2.501	2	1.25	3.656	0.027
	Within Groups	100.877	295	0.342		
	Total	103.378	297			
UVM	Between Groups	5.729	2	2.865	7.392	0.001
	Within Groups	130.593	337	0.388		
	Total	136.322	339			

Table 5. Comparison across Age Group

Dependent Variable	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.
HVM	Old	Middle aged	-0.12569	0.07656	0.23
		Young	-.23688*	0.09013	0.024
	Middle aged	Old	0.12569	0.07656	0.23
		Young	-0.11119	0.09178	0.447
	Young	Old	.23688*	0.09013	0.024
		Middle aged	0.11119	0.09178	0.447
UVM	Old	Middle aged	-.28430*	0.07642	0.001
		Young	-0.1982	0.09167	0.079
	Middle aged	Old	.28430*	0.07642	0.001
		Young	0.0861	0.0977	0.653
	Young	Old	0.1982	0.09167	0.079
		Middle aged	-0.0861	0.0977	0.653

* The mean difference is significant at the 0.05 level

Table 6. ANOVA: Gender

		Sum of Squares	Df	Mean Square	F	Sig.
HVM	Between Groups	2.012	1	2.012	5.988	0.015
	Within Groups	113.565	338	0.336		
	Total	115.577	339			
UVM	Between Groups	5.746	1	5.746	14.875	0
	Within Groups	130.575	338	0.386		
	Total	136.322	339			

Table 7. Descriptive- Gender

		N	Mean	Std. Deviation	Std. Error
HVM	Female	205	3.8654	0.54469	0.03804
	Male	135	3.7081	0.62915	0.05415
	Total	340	3.8029	0.5839	0.03167
UVM	Female	205	3.4123	0.67924	0.05846
	Male	135	3.678	0.58053	0.04055
	Total	340	3.5725	0.63414	0.03439

Table 8. ANOVA: Income

		Sum of Squares	Df	Mean Square	F	Sig.
HVM	Between Groups	0.372	2	0.186	0.544	0.581
	Within Groups	115.205	337	0.342		
	Total	115.577	339			
UVM	Between Groups	0.65	2	0.325	0.807	0.447
	Within Groups	135.672	337	0.403		
	Total	136.322	339			

Table 9. Comparison across Income Level

Dependent Variable	(I) Income	(J) Income	Mean Difference (I-J)	Std. Error	Sig.
HVM	Low	Middle	0.02288	0.07691	0.952
		High	0.08022	0.07938	0.571
	middle	Low	-0.02288	0.07691	0.952
		High	0.05734	0.0771	0.738
	High	Low	-0.08022	0.07938	0.571
		Middle	-0.05734	0.0771	0.738
UVM	Low	Middle	-0.01648	0.08347	0.979
		High	0.08401	0.08615	0.593
	middle	Low	0.01648	0.08347	0.979
		High	0.1005	0.08367	0.453
	High	Low	-0.08401	0.08615	0.593
		Middle	-0.1005	0.08367	0.453

** The mean difference is significant at the 0.05 level*

Figure 1. The Conjectured Path

To test Hypotheses Four, Five and Six, we have conjectured a path (Figure 1) showing the relationship between Shopper Values, Customer Satisfaction and COPE. The measurement model was tested using Confirmatory Factor Analysis. The output of the model with the factor loadings and reliability values for each construct is mentioned in Table 10. The Convergent and Discriminant validity of the model was also tested and found to be appropriate (Table 11). Subsequently, SEM was used to test the hypothesized paths. All three paths were significant, as mentioned in Table 12.

Table 10. Summary of results from the scale

Dimensions	Variables	Factor loadings	Reliability (Alpha values)
Hedonic Value (H.V.)	HV1: I had fun while shopping online	.905	.875
	HV2: I visit online platforms even if I don't have to buy a product	.801	
	HV3: I felt energized and liberated while shopping online	.800	
	HV4: I enjoyed the time spent navigating the products online	.795	
	HV5: I looked for new products for fun	.772	
	HV6: Online shopping was enjoyable because of the experience, not just for the products I purchased	.873	
	HV7: I could take decisions fast and that made me happy	.802	
	HV8: Shopping online was exciting	.779	
	HV9: It made me forget my problems when I shopped online	.860	
	HV10: While shopping, I felt a sense of adventure	.661	
Utilitarian Value (U.V.)	UV1: Online shopping felt like accomplishing a task that I wanted to	.875	.863
	UV2: The items needed for my purchase basket were available online	.824	
	UV3: The platform/website was helpful in finding the items I needed	.774	
Customer Satisfaction (C.S.)	CS1: Shopping for services/products from the online store or platform is a good idea	.812	.847
	CS2: I am pleased with the online shopping experience	.833	
	CS3: I liked purchasing products from the online Platform or store	.793	
	CS4- I am happy and satisfied with the overall experience of shopping Online	.812	
Customer Online Purchase Engagement (COPE)	COPE1: I think about the online platform/store while using products purchased online	.750	.784
	COPE2: I feel very positive when I shop online from the platform/store	.687	
	COPE3: I enjoy spending time purchasing online from the Platform/store	.703	.
	COPE4: I feel good when I purchase products online	.615	

Source: Primary data

Table 11 (a). Convergent Validity

Constructs	Constructs Reliability	Average Variance Explained (AVE)	Scale Reliability	Convergent validity
Hedonic value	.875	.790	Yes	Yes
Utilitarian value	.863	.843	Yes	Yes
Customer satisfaction	.847	.657	Yes	Yes
COPE	.784	.585	Yes	Yes

Source: Primary data

Table 11 (b). Discriminant Validity

Constructs	Average Variance Explained (AVE)	Hedonic value	Utilitarian value	Customer Satisfaction	COPE
Hedonic Value	.790	**.889**			
Utilitarian Value	.843	.353	**.918**		
Customer Satisfaction	.657	.317	.254	**.810**	
COPE	.585	.412	.273	.262	**.765**

Source: Primary data

Table 12. Path Coefficients and Hypothesis Testing

Hypothesis: Construct relationship	Standardized Regression Weight	p-value (Sig)	Status
H4: Hedonic value → Customer Satisfaction	.414	***	Sig
H5: Utilitarian value → Customer Satisfaction	.343	***	Sig
H6: Customer satisfaction → COPE	.178	***	Sig

Source: Primary data

Note: Sig=significant

Notes: Convergent validity criteria: AVE is more than 0.5, reliability is more than 0.7, and reliability is more than AVE (Hair et al., 2011).

Discriminant Validity Criteria: The diagonal data is the square root of AVE, which is more than inter-construct correlations (Fornell & Larcker, 1981).

Hedonic Value leads to Customer Satisfaction: Having discussed the role of demographic variables on hedonic and utilitarian value, the research extended the impact of such values on customer satisfaction in an online environment. It is evident from the SEM output that hedonic value leads to customer satisfaction (β= 0.414). So it suggests that if customers find the online shopping experience fun and enjoyable, they are satisfied with the product or service and subsequently engage in purchasing more. This is evident from a significant β score for the path from satisfaction to COPE. The research also suggests that high-income female customers can be provided a better engagement and satisfying experience through hedonic parameters as they rate hedonic value over utilitarian value.

Utilitarian value leads to Customer Satisfaction: Like hedonic, utilitarian value also leads to customer satisfaction (β=.343) though its impact is less compared to that of Hedonic value (β=0.414). As middle-income male customers rate utilitarian values higher than hedonic, such target customers can get satisfied with utilitarian attributes like 'availability of their desired product online' and 'easy and simple navigation'. However, both values are essential in creating a satisfied customer who subsequently engages with the online platform/website, indicating a direct relationship between satisfaction and COPE.

8. Conclusion and Implications

This study aimed to understand the impact of demographic variables like age, income and gender on hedonic and utilitarian shopper values. Further, the study examined the relationships among shopper value, customer satisfaction and COPE in the Indian online retail environment. The analysis revealed that both hedonic and utilitarian values significantly influence customer satisfaction. Our study is consistent with the past studies by Kisang Ryu et al. (2010) and Valter Vieira et al. (2018). But one of the findings of the paper, “customer satisfaction is influenced more by hedonic value than the utilitarian value”, differs from past studies by Lee et al.(2017). With respect to demographic variables, shoppers across age groups were driven by hedonic value though the extent differed. Income had no impact on shopper responses to both types of values. However, hedonic value was preferred by the female, and male respondents preferred utilitarian value.

The path analysis confirmed the relationship between Shopper Value, Customer Satisfaction and COPE, indicating the positive impact of Shopper Value.

Online retailers and platforms can use the implications in designing their customer acquisition and retention strategy. For example, as male customers look for utilitarianism and female customers look for hedonism, the retailers can plan the shopping experience for the respective groups accordingly. Similarly, depending on the target segment as young, middle ages or old customers, online retailers should design their target market strategy in terms of the shopper values they want to offer and prioritize. Online retailers aim to enhance their shopper engagement by providing better user interface and navigation facilities (Swar & Panda, 2021). This paper augments this finding suggesting that enhancement of shopper value can lead to higher satisfaction and, in turn, higher customer online purchase engagement.

The paper also has a few research implications for the future. The same study can be replicated for specific online formats, and their results can be compared to get better insights. The causality between shopper values, shopper satisfaction and COPE can also be studied further for specific retail formats and geographies.

8.1 Limitations and Scope for Further Research

The study focused only on Indian online retail formats in general. Thus, more research is needed into new and emerging formats of online retailing. Additionally, the other demographic variables can also be considered to extend the research; therefore, future studies should include more shoppers to test the relationships. Future research can be done by using consumption motivations and pleasure-seeking with respect to utilitarian and hedonic values.

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