उनसठवाँ वोल्यूम : नं. १,२ जनवरी–जून २०२३ / जुलाई–दिसंबर,२०२३
VOL. LIX : No.1, 2 : JANUARY-JUNE 2023 / JULY-DECEMBER 2023 (Combined Issue)

R. N. No. 15058/67 ISSN : 0004-3567

ARTHA - VIKAS

अर्थ – विकास

Bi-annual peer-reviewed and refereed journal
Published since 1965

JOURNAL OF ECONOMIC DEVELOPMENT

University Press

POST GRADUATE DEPARTMENT OF ECONOMICS
SARDAR PATEL UNIVERSITY, VALLABH VIDYANAGAR

Department of Economics
Sardar Patel University, Vallabh Vidyanagar

Post Graduate Department of Economics, Sardar Patel University was established in 1958. The Department is the first & the only Department of Economics in the state of Gujarat to have been awarded the status of Centre of Advanced Studies in Economics (CAS – Phase two) in January 2018 by the UGC. Prior to that the Department has been a recipient of SAP (Special Assistance Program) Phase 1, 2,& 3; a generous ASIHSS grant, & CAS (Centre of Advanced Studies) Phase 1. The Department undertakes multidimensional *teaching, research & extension activities*, with one benefitting the other.

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The Department has been involved in undertaking various *extension activities* related to creating positive impact on raising the productivity of livestock farming, eco-friendly disposal of unused & expired medicines, preparing a statistical outline of the data of Sardar Patel University for two decades, preparing a standard tabulation format for data collection for various universities, charity for old age homes & orphanages, &tree plantation, among others.

However, the Department aspires to ascend knowledge, wisdom,&fulfilment of shared responsibilities by & for the various stakeholders associated with the Department & the larger sections of the society. As we endeavor on this journey, we seek to join hands & collaborate with like-minded & similarly inspired individuals & organizations.

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(JOURNAL OF ECONOMIC DEVELOPMENT)

Published since 1965

R.N. No. 15058/67 **ISSN : 0004-3567**

VOL. 59 JANUARY-JUNE 2023 / JULY-DECEMBER 2023 NO. 1 & 2

CONTENTS

MARKETING SYSTEM AND PRICE REALISATION OF INDIAN CRUDE PALM OIL BY SMALL FARM HOLDERS

Dr. Shilpa S K* Prof. A. N. Vijayakumar**

Abstract

The study aims to examine the existing marketing system of oil palm and price realised by the smallholder farmers in the selected two states of India (Andhra Pradesh and Telangana). For this purpose, 120 smallholder farmers, the company executives and government officials were interviewed. The results revealed that the entire oil palm produced by the farmers in the study areas were marketed through the companies set up in those regions and the farmers' share of the crude oil palm price is predetermined by the government to promote the production of palm oil and to protect the interest of the farmers. However, smallholder farmers reported few challenges in the existing marketing system.

Keywords: *Oil palm, Smallholders, Marketing system, Price realized, Challenges.*

Introduction

The demand for vegetable oils is reported significant increase in the recent past due to its use in the production of fuels, culinary soaps, and perfume formulations. The global production of vegetable oil increased by 125 percent between 2000 and 2019, reaching 208 million tonnes in 2019, with Asia contributing 150% and America contributing 96% increase in production of vegetable oil during this period (FAOSTAT, 2021). The vegetable oil consumption least quare growth rate during the period 2011 to 2020 was 3.87% and projected to 1.33% during the period 2021 to 2030 (OECD/FAO, 2021). Among the vegetable oils, palm oil accounts for the majority of the total market share of vegetable oil. Around 60-70 per cent is used for human consumption and rest is used for industry such as, pharmaceuticals and others[1].

The CPO production is estimated at 49 million tonnes (2021), with the contribution from leading global producers namely Indonesia (57%) and Malaysia (27%). In the international Crude Palm oil market, the countries of Indonesia, Malaysia, Nigeria, Thailand, and Cambodia together accounts for ninety percent of the global production of Fresh Fruit Bunches of palm oil. The production and marketing of oil palm generates higher income through export revenue and taxes to the leading producing countries such as Indonesia and Malaysia. As the world's leading suppliers of palm oil, they jointly account for nearly 60% of global exports (OECD/FAO, 2021).

India being an agrarian economy, has diverse demand for various types of oils and produces substantial quantity of different oilseeds. It is also the world's major importer of palm oil. During the year 2020-21, India imported around 133.52 lakh tonnes of edible oils, out of these imports, the share of palm oil was about 56%, followed by soybean oil 27%, and sunflower oil 16% (National Food Security Mission, Guidelines-2021). India being the major importer of palm oil has a dominant position to influence relative prices of soybean and edible oils (Carter et al., 2007). As per the union budget 2021-22, the basic customs duty on CPO reduced from 27.5% to 15%, and an Agri- cess of 17.5% has been imposed on CPO, since, January 2020 onwards. The import policy of refined palm oil (RPO) has been revised from "free" to restricted category from November 2020. This led to reduction of import duty from 37.5% to 27.5%. The Government of India initiated the Technology Mission on Oil Seeds (TMO) Program in 1985-86 to enhance the palm oil production in India

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1. https://www.globenewswire.com/en/news-release/2023/04/06/2642395/28124/en/Global-Palm-Oil-Market-Factbook-2023-Edition-Transition-to-Sustainable-Production-Crucial-for-Future-Growth.html

(Yahya & Gunawan, 2019). Subsequently this Technology Mission on Oil Seeds was changed into National Mission on Oilseeds and Oil Palm (NMOOP) with effect from 2014. Further the government approved ?11,040 crore outlay with effect from 2022 for a period of 5 years for National Mission on Edible Oils - Oil Palm (NMEO-OP, 2021) to strengthen the domestic oil sector against dependence on imported edible oils. This mission also proposes to expand additional area 6,50,000 hectares by 2025-26 to increase the production of palm oil to 11.2 lakhs tonnes by 2025-26 and 28 lakhs tonnes by 2029-30.

The CPO sector provides employment opportunities to large number of people in rural areas. The sector consists largely of small farm holders supplying fresh fruit bunches of palms to the processing oil mills. It is projected that around 7 million small farm holders are depending on oil palm sector for their livelihood in the palm oil producing countries. The engagement of small and marginal farmers is noticed across the value chain of palm oil sector (Rahman et al., 2008), considering economic viability for higher farm income (Sukiyono et al., 2022). India, off-late, has been encouraging oil palm production in the country with a special promotional scheme. In India, the states of Andhra Pradesh (83.32%), Telangana (13.6%) and Kerala (1.48%) are contributing significantly to total palm oil production of the country (2021). The supply chain of CPO has been monitored by state governments to facilitate farming communities to realise economically viable farm income. However, there is a dearth of scholastic evidences in understanding marketing system and issues of concerns of CPO farmers in the country. In this regard, this paper motivations on understanding farmers issues of concerns and effectiveness of the current palm oil marketing structure in promoting the prosperity of small farm holders in India. Additionally, it also addresses the issue of changes in Oil Extraction Rate (OER) on pricing of palm oil and its impact on farmers.

Review of Literature

CPO considered to be golden crop is majorly grown by smallholder farmers that aid in combatting poverty and relief from food and energy crisis (Mohd Noor et al., 2017) as it can be produced at low cost (Carter et al., 2007). Moreover, Talib & Darawi (2020) mentioned the significant contribution of Malaysian palm oil sector to global palm oil market and stated that fertile soils, favourable weather, political stability, proper management, and effective policy implementation by the private and public sectors have influenced growth of the sector. Also, Yean & ZhiDong, (2012) identified that the domestic supply and demand of Malaysian oil palm sector is projected to enhance its production capacity in meet the growing demand of developing countries. Though, Schleifer & Sun, (2018) elaborated the role played by the Chinese government in raising awareness and creating firms' interest in sustainable growth of palm oil and stated that favourable market environment, higher level of state support, and greater influence of the multinational regional corporations foster sustainable palm oil production. Nikoloyuk et al., (2010) recommends for designing of an effective governance structure for ensuring sustainability of CPO production, to overcome the dependency on powerful players posing a serious structural issue, as proposed by the Roundtable on Sustainable Palm Oil (RSPO).

Scholastic studies have presented the role played by the market factors on the price volatility of oil palm. It was witnessed that international price of palm oil had positive correlation on the price of vegetable oil and animal fat (Senturi, 1988) and the global palm oil price including oil substitution prices and policy instruments, influenced the marketing system of Malaysian palm oil (Lubis, 1998). While, Jongsombatpibul & Pornchaiwiseskul, (2016) found that CPO price and soybean oil price have unidirectional causality long-term relationship, but they do not exhibit asymmetric price transmission. Further, (Chatsirapob, 2018) stated that CPO price in Thailand is influenced by the farm-gate price, palm stearin price and export market price of refined palm oil. Whereas, the supply of palm oil in the international market is positively influenced by the price, the area and the supply of oil palm in the previous years (Buyung, 2018); Saleerut et al., (2020) witnessed that the fluctuations in the global market price of oil palm affects the farmgate price primarily, followed by the wholesale price, the export market price and the retail price respectively.

Parimala (2021), analysed the financial performance of oil palm plantation in Andhra Pradesh using financial models, and found that the plantation of oil palm was financially profitable as the changes in the selling price of palm oil had a greater impact on the oil palm plantation's financial performance than changes in total cost and total revenue. Also, as a monoculture crop, oil palm exposes communities to very high social and environmental risks (Anderson, 2006), since the global palm oil industry is facing a number of challenges that can impact production, sustainability, and profitability aspects, these include domestic supply and demand fluctuations, high import duties imposed by importing countries, competition from neighbouring countries, rising costs of farming, and uneconomical land sizes (Ahmad et al., 2020). Also, non-availability of raw materials (FFBs) is the key issue faced by palm oil processing units (Srilatha, 2017). Although, the palm oil sector can be a lucrative source of income, for smallholders (Feintrenie et al., 2010; Rist et al., 2010); the rising palm oil demand, the evolution of RSPO, supply channels, price volatility, deforestation, high input costs, and a shortage of refinery mills (Barthel et al., 2018, Mohd Noor et al., 2017) , have created certain hurdles for producers of smallholder oil palm in developing nations. Similarly, market fragmentation and price volatility are primary constraints witnesses in the Indian palm oil sector (Malhotra & Sharma, 2016) . Furthermore, as the CPO smallholder farmers are highly depended on estate mills for palm oil processing, it limits their remunerative price realization (Anderson, 2006). Besides, they are facing challenges in certification, as it demands a set of financial, managerial, and agro-economic capacities (Brandi et al., 2015). Studies have shown that the price of palm oil is affected by market factors such as the price of vegetable oils and animal fats. Since, oil palm is a monoculture crop, it poses high social and environmental risks, and smallholder farmers face issues with limited prices due to their reliance on estate mills. From the above scholastic evidences, it is noted that studies from the Indian perspective of crude palm oil marketing and pricing are limited. India being the largest consumer of crude palm oil has been promoting cultivation of palm oil and undertaken several policy measures to support small farm holders in realising remunerative prices. It is therefore, this study shall contribute on marketing system and challenges of small farm holders in realising remunerative prices.

Research Methodology

This study focusing on Indian Palm oil sector emphasised on marketing system and difficulties of small farm holders. The data were collected through an unstructured questionnaire from smallholder farmers with landholding from 1 hectare to up to 2 hectares (RBI, 2008), focusing on the marketing system and challenges. The study area was limited to the states of Andhra Pradesh (83.32%) and Telangana (13.65%), as they are being the major oil palm producing states (MoA & FW , 2021). The study used purposive and convenient sampling method and 10 respondents from each 12 major districts in Andhra Pradesh and Telangana were chosen aggregating 120 respondents. The study investigated to describe marketing system of oil palm in practice. The challenges and issues of smallholder farmers have been measured by using a five-point Likert scale. The data collected was analysed using descriptive statistics. Secondary data were compiled from Malaysian Palm Oil Board and other repositories for the purpose of this study.

Table No 1: Details on study area and sample respondents

Sl.no	State	Districts	Number of Respondents
1	Andhra Pradesh	Srikakulam	10
2		Vizianagaram	10
3		Visakhapatnam	10
4		East Godavari	10
5		West Godavari	10
6		Krishna	10
7		Nellore	10
8		Anantapur	10
9	Telangana	Khammam	10
10		Bhadradri Kothagudem	10
11		Nalgonda	10
12		Surya pet	10
	Total		**120**

(Source: Field survey)

Results and Discussion

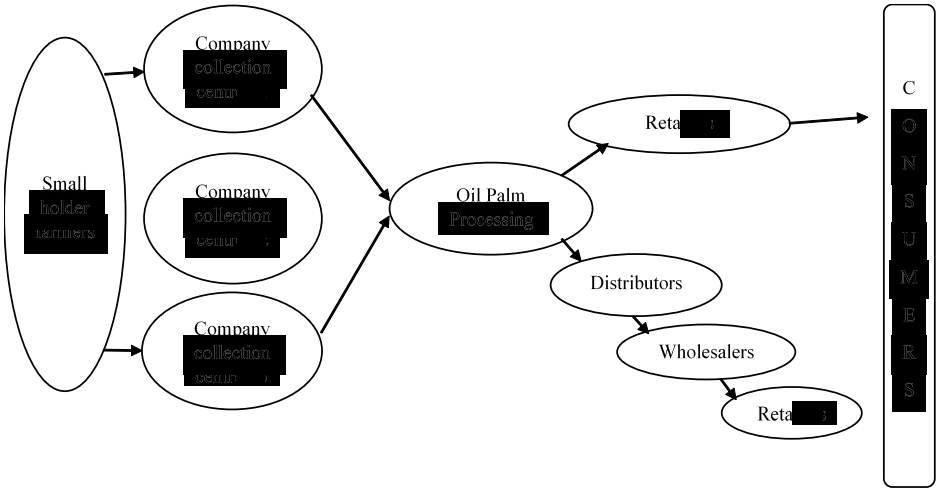
Marketing system of Crude Palm Oil

From the discussion with the state officials and company executives from the states of Andhra Pradesh and Telangana, it was understood that, as per the Oil Palm Act (2020 - 21), zones are formed to promote the oil palm production depending on the scope and potential production in that region. In each of the zones, potential districts are identified for setting up the companies according to the forecasted production quantity of palm oil. The farmers cultivating oil palm in this district are expected to sell their entire produce to the companies operating in that district.

Additionally, the farmers were interrogated to understand the marketing system they adopted. It was stated that farmers were selling entire oil palm produced by them to the companies, and the companies in each district owned oil palm collection centres and the farmers distributed their produce to the collection centres, which were connected to the refinery mills. From the refinery mills, the produce was distributed through the distributors, wholesalers, and retailers to reach the end consumers.

The marketing system for oil palm with specific reference to Andhra Pradesh and Telangana states is represented in Figure 1.

Figure 1: Marketing System of Crude Palm Oil



Source: Authors description based on interviews

Price Realization Mechanism

The farmers engaged in the production of oil palm from Andhra Pradesh and Telangana were interrogated to understand the price realised by them. Also, government officials and company executives were involved in providing inputs regarding the price realisation mechanism by the farmers. From the discussion with the government officials, it was understood that zones were identified by the government in potential areas for setting up of companies for processing of oil palm in the study area. The farmers producing oil palm in various districts part of zone are expected to sell their entire produce to the companies operating in that region.

The companies sell crude palm oil in the open market based on supply and demand conditions. The Bursa Malaysia Derivatives Exchange (BMD) manages Malaysia's crude palm oil futures contract, which sets the global price benchmark and determines the price of CPO (Reuters, 2021). It is interesting to notice that the government has fixed 75.25% of the net CPO price to be shared by the companies with the farmers (G.O. Rt. No 623, Dt: 14.12.2021 of Agri & Coop Dept, TS).

The pricing of FFBs (Fresh Fruit Bunches) of CPO is based on the net CPO price plus the weighted average price of palm nuts. The net CPO price is calculated based on the average OER (Oil Extraction Ratio) for a particular year. The OER is a measure of the efficiency of entire palm oil production process, influenced by condition of plantation and the competence of processing mills (Vishandass & Gulati, 2012). The OER is calculated based on the number of fresh fruit bunches crushed and the percentage of oil extracted from the FFBs.

$$\textbf{OER} = \frac{\textit{Total Quantity of FFBs}}{\textit{Oil Extracted}}$$

Using the formula for instance, for 1 lakhs tonne of FFB crushed if the oil extracted is coming to be 20 tonnes in that case the OER will be 20%. The OER is calculated for every year ending the month of October. During the study period July 2022 to December 2022, OER was 19.22 percentage. So, in this case considering 75.25% of farmers share for the average OER of 19.22%, the net Crude Palm Oil for farmers arrives to be (75.25% on 19.22) 14.46%. Additional data on the OER for a period of five years for CPO in domestic and international markets was collected to understand the trend (Refer to Table 2). From the mentioned Table 2 indicates that there is not much variations observed in the domestic and international Oil extraction rate. During the year 2020 - 21, it was revealed that palm oil in India was not matching the international standards. For the year 2020 a variation of 1.72% and for the year 2021, 1.03% was noticed. However, in the year 2022 minor variations to the extent of point 0.75 was observed reflecting improvement in OER compared to international standards.

Table 2: Domestic and International Price of OER

Sl.no	Year	(Andhra Pradesh & Telangana)	Malaysia
1	2019	NA	20.19
2	2020	18.20	19.92
3	2021	18.68	19.71
4	2022	19.22	19.97
5	2023	19.32 (Projected)	NA

(Source: Economics and Industry Development Division, Malaysian Palm Oil Board (2023) and Primary data)

The pricing of fresh fruit bunches of oil palm in India is based on the net CPO price plus weighted average price of palm nuts. During the study period, the weighted average price of palm nuts was observed to be 10.25% - considering the farmers share of 75.25% of weighted average price of palm nuts (75.25% on 10.25%), the farmers portion of palm nut price will be calculated.

The formula for pricing of fresh fruit bunches of oil palm for a particular Oil year*

*Oil year - November to October is defined as the oil year (DFPD, 2023).

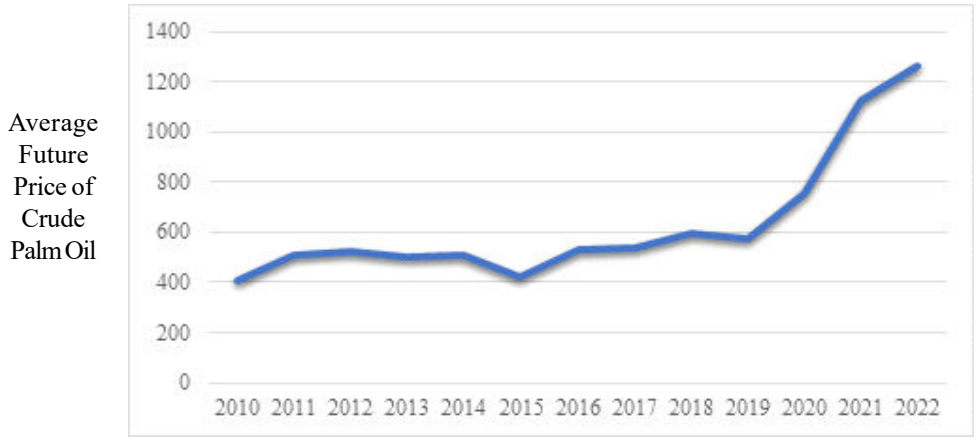
$$\textbf{Price of FFB for a month} = \textit{Net CPO Price}\ (75.25\%\ \text{on average OER for Oil Year}) + \textit{Weighted Average Price Of Palm nuts}\ (75.25\%\ \text{on}\ 10.25\%)$$

During the study period, it was observed that in Andhra Pradesh same month average CPO and nut prices were considered for arriving the price of FFB for that month. However, in Telangana average previous month CPO and nut prices were considered for next month price of FFB.

Issues and challenges

From the comprehensive discussion with the small holder farmers, company executives and government officials it was implicit that smallholder farmers faced certain challenges in the current marketing system. The data collected from the smallholder farmers from Andhra Pradesh and Telangana using the 5-point Likert scale was used to arrive at five major challenges they faced. A total of five challenges were identified (Refer Table no:3), including price volatility, absence of alternative marketing channels, limited market information, lack of logistics support and shortage of quality inputs.

Figure: 2 Average Future Price of Crude Palm Oil in India (2010-2022)



(Source: Investing.com)

The findings show that price volatility is the primary issue in the existing marketing system of CPO affecting remunerative price realisation by smallholder farmers. This statement is supported by the data provided (Refer the Figure no: 2). Recent studies have discussed the issues and challenges of palm oil sector, they have (Wissler, 2015; Barthel et al., 2018; Malhothra & Sharma, 2016), highlighted volatile price of CPO, along with the fluctuated domestic supply and demand by (Ahmed et al., 2020) and high operational costs, less profit margin, and lack of refinery mills (Malaysia Productivity Corporation 2014), to be the issues concerned to the palm oil sector.

The study findings confirms that smallholder farmers are looking for an alternative marketing channels to market their produce, as the existing marketing system is limiting the sale of produce to the companies only.

Studies have proposed alternative marketing channels to enhance the financial viability of the smallholder farmers in reducing the market risk and getting access to the markets (Hardesty & Leff 2010). Additionally, limited market information was found to have a significant impact on the smallholder farmers. As stated by Ma and Abdulai, (2016) , in emerging economies, smallholder farmers lack access to market information limiting them in attaining livelihood sustainability. Onuja et al., (2014) and Apind et al ., (2015) also exhibited similar results regarding the role of market information on market participation by smallholder farmers. Only few companies are providing transportation support to the smallholder farmers and many of these smallholder farmers have to spend on the transportation expenses which is having a negative impact on their revenue generation. Hence, the farmers expect all the companies across the districts to provide transportation support in both the states. This issue is in line with the results of Agbola et al ., (2010), where it was experienced that high transportation cost was leading to poor market participation by smallholder farmers. Finally, the present study found shortage of quality inputs do affect the quality of output in term of fresh fruit bunches, implying OER not matching the international standards. Kinyondo & Magashi (2017), observed similar problem limiting the smallholders' rural livelihoods in Tanzania.

Table 3. Issues and challenges in marketing of oil palm faced by selected smallholder oil palm farmers

Sl.no	Major issues and challenges	Mean	Std. Deviation	Rank
1	Price volatility	4.12	.78	1
2	Absence of alternative marketing channels	3.81	.84	2
3	Limited Market information	3.77	1.05	3
4	High cost of transportation	3.75	.85	4
5	Shortage of quality inputs	3.52	.68	5

(Source: Primary data)

Conclusion

This study aimed to examine the marketing system of oil palm and price realised by smallholder farmers within the system. One of the unique contributions of this paper comprises of presenting the price fixation formula for oil palm smallholder farmers for the first time. In the process, the role played by government in promotion of oil palm sector and protecting the interest of smallholder farmers was elucidated. The findings confirms that the oil palm marketing system in India is directed by the regulatory and policy decisions.

Research Implications

It was recognised that the small holder farmers do not have an option to market their produce except to the companies in that region. This implies poor bargaining power of the farmers in the marketing system. Also, it is observed, the price fixation formula for FFBs linked to OER is not matching the international OER observed for a span of 4 years implying moderate quality of FFB in India.

The price fixation is done by the government to promote the production of oil palm in India and to protect the interest of the farmers, however, a few issues were identified as the CPO price is driven by international market factors. Also, it was observed during the study period that Andhra Pradesh considered average CPO price of same month for price fixation of FFBs (Fresh Fruit Bunches), while Telangana followed previous months average for price fixation. This system is leading to price discrimination among the farmers in these two states. Hence, it is necessary to follow one methodology for price fixation. In order to avoid confusion, it is proposed to follow same month average CPO and nut price for same month FFBs price fixation. Further the company

collection centres should provide same support in terms of inputs and transportation to planters in both the districts. The existing marketing system of oil palm is regulated, but the government may explore the option of setting up mini processing units link for special interest group of farmers in few regions. Though the existing marketing is not giving an option to the growers to explore the alternative marketing channel. The alternative marketing channels may be explored for the benefit of smallholder farmers in the future, to reduce dependence on imports to meet the domestic market requirements.

Acknowledgement

This research paper is prepared as a part of the research programme (Grant no. 07/2021-22), author's thankfully acknowledge the financial grants received from sponsoring authority, ICSSR, New Delhi.

First Submission: April, 24, 2023 **Revision Accepted on: July 07, 2023**

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INFLUENCE OF CORPORATE GOVERNANCE AND GENDER DIVERSITY ON FIRM PERFORMANCE IN DEVELOPING COUNTRIES

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Abstract

The aim of this research is to examine the influence of corporate governance and gender diversity on firm performance in developing countries. The influence of board size, board independence, board meetings, audit committee size, audit committee independence, audit committee meetings and gender diversity on firm performance has been examined in this study. For the purpose of this research, data was collected from the annual reports of firms operating in developing countries for the period 2010 to 2019. This study reveals that independence of boards and independence of audit committees as well as gender diversity are essential tools to enhance firm performance in the context of developing economies. This is because the findings of this paper reveal that board independence, audit committee independence and the number of female directors on the board have positive influence on firm performance. Nonetheless this study also documents that in the context of developing countries; board size, board meetings, audit committee size and audit committee meetings have no significant influence on firm performance. This paper contributes to the limited studies in the context of developing economies regarding the influence of corporate governance and gender diversity on firm performance.

Keywords: *Corporate governance, gender diversity and firm performance.*

Introduction

Corporate Governance is the way a firm operates, its processes and its structure (Chen, 2021). Good governance helps to protect the interest of stakeholders of a firm, it helps to prevent corporate failures and it also helps to improve firm performance. The practice of adhering to a corporate governance regime has firstly been in vogue in developed countries and corporate governance has been beneficial to developed economies (Giurca Vasilescu, 2008). In addition, developed countries have also introduced the concept of gender diversity whereby one of its main elements is to encourage the presence of female directors on the board of directors.

Corporate governance practices and gender diversity have enabled firms in the developed economies to improve firm performance (Carter et al., 2003; Giraldez & Hurtado, 2014; Barka & Legendre, 2016; Conyon & He, 2017; Alzeban, 2019; Fernando et al.,2020). Developing countries have tried to follow the path of developed economies by introducing corporate governance codes as well as by adopting the concept of gender diversity. It is often argued that developing countries suffer from weak legal system (Rabelo and Vasconcelos, 2002). In addition, emancipation of women is at a high level in developed countries whereby gender diversity is highly promoted and presence of female directors on board of directors is a common practice. However, in developing countries emancipation of women may not be to a comparable standard as in developed countries and presence of female directors on board might not be popular in such countries. This leads us to a crucial question to know whether corporate governance practices and gender diversity have been effective in improving firm performance in developing countries.

Objectives and Hypotheses

Many studies have investigated the influence of corporate governance on firm performance as well as the influence of gender diversity on firm performance. However, these studies have mostly focused on developed

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economies and studies in this area are limited in the context of developing countries. Moreover, many studies have documented that corporate governance practices as well as gender diversity have been effective in improving firm performance in developed economies (Carter et al., 2003; Giraldez & Hurtado, 2014; Barka & Legendre, 2016; Conyon & He, 2017; Alzeban, 2019; Fernando et al.,2020). However, it is not clear whether corporate governance practices and gender diversity has been effective in enhancing firm performance in the context of developing economies. In this regard, this research investigates the influence of corporate governance and gender diversity on firm performance in developing countries in order to contribute to the limited literature regarding this field in the context of developing economies. The hypotheses of this study are as follows.

H1: There is a negative relationship between board size and firm performance in developing countries.

H2: There is a positive relationship between frequency of board meetings and firm performance in developing countries.

H3: There is a positive relationship between board independence and firm performance in developing countries.

H4: There is a negative relationship between audit committee size and firm performance in developing countries.

H5: There is a positive relationship between audit committee independence and firm performance in developing countries.

H6: There is a negative relationship between frequency of audit committee meetings and firm performance in developing countries.

H7: There is a positive relationship between gender diversity and firm performance in developing countries.

Review of Literature

Corporate governance failures and financial scandals across the world has led to a dire need to study the impact of corporate governance on firm performance (Brown and Caylor, 2006; Ammann et al, 2011, Zhou et al, 2018). This research has employed the widely used corporate governance variables to investigate the influence of corporate governance on firm performance. The corporate governance variables used in this study are board size, board meetings, board independence, audit committee size, audit committee meetings and audit committee independence. This research has also investigated the influence of gender diversity on firm performance and the presence of female directors on the board of directors has been used as a proxy for gender diversity.

Board size and firm performance

The agency theory (Jensen & Meckling, 1976; Ross, 1973) advocates that larger board size is beneficial to a firm. This is because more members on the board is equal to a large group of people working in the interests of shareholders such that there will be better supervision and monitoring, and this eventually improve firm's performance (Kalsie & Shrivastav 2016; Garcia-Ramos & Diaz Diaz, 2020). Similarly, the resource dependence theory advocates that larger board will bring a plethora of skills and knowledge to the company such that firms with larger board size have an abundance of resource availability which helps to improve firm performance (Nicholson & Kiel, 2007). However, the stewardship theory postulates that managers are reliable and thus are benevolent stewards who use resources delegated to them efficiently (Donaldson and Davis, 1991, 1994; Donaldson, 1990). This theory advocates a negative relationship between board size and firm performance as fewer directors are needed to supervise managers. Empirical studies have documented mixed evidences on the link between board size and firm performance. Dalton et al. (1999) and Kalsie and Shrivastav (2016) documented a positive link between board size and firm performance. However Lipton and Lorsch (1992), Jensen (1993), Garcia-Ramos and Garcia-Olalla (2011) and Garcia-Ramos et al. (2017) argued that overextended boards curb the proper functioning of the board which results in poor firm performance.

Despite that the agency theory and resource dependency theory advocates a positive link between board size and firm performance, there is little empirical evidence that shows such a positive link. In fact, many

existing studies revealed a negative link between board size and firm performance. Hence a negative link can be anticipated in the context of this study between board size and firm performance.

Board meetings and firm performance

According to the agency theory, higher number of board meetings improves the monitoring mechanism resulting in reduction of agency costs and higher firm performance (Conger et al., 1998; Vafeas, 1999; Eddleston & Kellermanns, 2007). However, it is also argued that board meetings are costly because of travel expenses, directors' meeting fees, refreshments and loss of managerial time which result in lower firm performance (Taghizadeh and Saremi, 2013; Oyerinde, 2014). Empirical studies such as Ntim and Osei (2011), Al-Daoud et al. (2016), Eluyela et al. (2018) and Buchdadi et al (2019) revealed a positive link between board meetings and firm performance. However, Aryani et al. (2017) concluded that frequency of board meetings has no effect on firm performance. In line with the agency theory and due to the fact that many existing studies revealed that higher number of board meetings enhances firm performance, this research expects a positive relationship between frequency of board meetings and firm performance.

Board independence and firm performance

According to the agency theory higher level of board independence enhances the supervision of managerial performance such that managers work towards shareholders' interest (Fama and Jensen, 1983; Pearce and Zahra, 1992; Johnson et al., 1996; Huang, 2010). Consequently, firm performance increases as the level of board independence increases. Studies such as Kula (2005), Giraldez and Hurtado (2014) and Karayel and Dogan (2016) documented a positive link between link between board independence and firm performance. Following the agency theory and the findings of most empirical studies that documented a positive association between board independence and firm performance, this research anticipates a positive relationship between board independence and firm performance in developing countries.

Audit committee size and firm performance

Agency theory advocates that large audit committee size promotes accountability, transparency and it also helps to improve firm performance (Basheer, 2014; Aimran et al., 2016; Swenson, 2016). The findings of Mohammed (2018) has demonstrated that larger audit committee size improves firm performance. However, many empirical studies (Vafeas, 1999; Sharma et al., 2009; Aldamen et al., 2012; Al-Matari et al., 2012; Qaiser Rafique & Al Mamun, 2015) have documented a negative association between audit committee size and firm performance by arguing that larger audit committees may take more time to reach a consensus which may negatively affect firm performance. Despite that the agency theory advocates a positive relationship between audit committee size and firm performance, there is little empirical evidence to confirm such a positive link. In fact, many empirical works have revealed a negative link between audit committee size and firm performance and this research anticipates a negative relationship between audit committee size and firm performance in developing countries.

Audit Independence and firm performance

An independent committee ensures effective supervision of financial reporting and external audits (Beasley, 1996; Carcello and Neal, 2003, Abbott and Parker, 2000). The agency theory supports greater independence of audit committee to act as safeguard against agency cost and information asymmetry, which may improve firm performance (Wiseman et al., 2012). However, the resource dependence theory advocates that a higher number of independent members on the audit committee will not enhance firm performance as it is more important to have a committee which is diverse in skills and knowledge than a committee which is independent (Pfeffer, 1987; Pearce & Zahra, 1992; Adams and Ferreira, 2007). Similarly, the stewardship theory encourages more executive members on audit committees than non-executive members as the theory postulates that executive

directors are not self-centered opportunists (Salehi et al., 2018). Al-Matari et al. (2012) and Zhou et al. (2018) documented that higher independence of audit committees does not improve firm performance. However, many studies have revealed a positive association between audit committee independence and firm performance. Examples of such studies are Kallamu and Saat (2014), Barka and Legendre (2016), Mohammed (2018) and Alzeban (2019). Based on the agency theory and the existing studies that have revealed a positive link between audit committee independence and firm performance, this research expects a positive relationship between audit committee independence and firm performance in developing countries.

Audit committee meeting and firm performance

The agency theory supports high frequency of audit committee meetings to increase firm performance (Conger et al., 1998). An audit committee that meets regularly is more experienced about accounting and auditing issues of the firm and the committee more efficiently oversees and curbs the firm's control risks such that firm performance improves (Al-Matari et al., 2012). The findings of Mohammed (2018) revealed a positive association between audit committee meetings and firm performance. However, studies such as Barka and Legendre (2016), Glover-Akpey and Azembila (2016) and Koutoupis and Bekiaris (2019), have documented a negative association between audit committee meetings and firm performance. Even though the agency theory advocates a positive link between frequency of audit committee meetings and firm performance, there is little empirical evidence to confirm such a positive link. Actually, many empirical works have revealed a negative relationship between number audit of committee meetings and firm performance. Consequently, this study anticipates a negative relationship between frequency of audit committee meetings and firm performance in developing countries.

Gender diversity and firm performance

According to the resource dependency theory a diverse board has greater access to expertise and has exceptional information that can better advise managers in decision-making and as a result it will help to improve firm performance (Hillman et al. 2000). In addition, many empirical studies have demonstrated that gender diversity improves firm performance. Examples of such studies are: Carter et al. (2003), Julizaerma and Sorib (2012), Sener and Karaye (2014), Conyon and Lerong (2017), Ullah et al. (2020), Fernando et al. (2020). Based on the resource dependency theory and most of the empirical studies that have demonstrated a positive influence of gender diversity on firm performance, this research anticipates a positive relationship between gender diversity and firm performance in developing countries.

Methodology

The objective of this research is to investigate the influence of corporate governance and gender diversity on firm performance in developing economies. Data was collected for the period 2010 to 2019 from the annual reports of 13 companies from 13 different countries namely Botswana, Ghana, Kenya, Malawi, Mauritius, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. To conduct this research, an unbalanced panel data of 126 firm year observations was constructed. For the purpose of this research, the following regression model has been employed which has been adapted from past studies such as Al-Matari et al. (2014); Al-Daoud et al. (2016) and Zhou et al. (2018).

$$ROE=\alpha + \beta 1BS + \beta 2BM + \beta 3BI + \beta 4ACS + \beta 5ACI + \beta 6ACM + \beta 7GD + \beta 8FS + \beta 9LEV + \beta 10EG + \beta 11IQ + \varepsilon$$

- ROE is a measure of profitability and it refers to Return on Equity
- BS refers to board size and it measures the number of directors on the board of a firm for a particular year.
- BM refers to board meeting and it measures the number of board meetings of a firm for a particular year.

- BI refers to board independence and it measures the number of independent non-executive directors on the board of a firm for each year.
- ACS refers to audit committee size and it measures the number of directors on the audit committee of a firm in each year
- ACI refers audit committee independence and it measures the number of independent non-executive directors on the audit committee of a firm for each year.
- ACM refers to the number of audit committee meetings of a firm for a particular year.
- GD refers to gender diversity and it measures the number of female directors on the board of a firm for a particular year.
- FS refers to the size of a firm for each year and it is measured using log of total assets.
- LEV refers to leverage of a firm for each year and it is measured as the ratio of total liabilities to total assets.
- EG refers to each year's economic growth of a country in which a firm is operating.
- IQ measures each year's institutional quality level of a country in which a firm is operating.

Following past studies such as Ammann et al. (2011); Aldamen et al. (2012); Al-Matari et al. (2012); Al-Matari et al, (2014) and Zhou et al., (2018), firm size, leverage, economic growth and institutional quality were included in the regression model as control variables. Data to calculate firm size and leverage were collected from annual reports of the firms whereas data on economic growth and institutional quality were collected from the World Bank database.

Findings from the Study and Discussion

Initially the Pooled cross-sectional OLS was used to process the regression model. Given that the Pooled cross-sectional OLS does not consider the heterogeneity and uniqueness of data sets, the Hausman test was subsequently conducted so as to determine whether the fixed effect or the random effect should be used. The fixed effect was deemed appropriate for this research because at 10% significance level, the p-value of the Hausman test was 0.000. The findings of the fixed effect are as follows

Variable	Coefficient	t-Statistic	Probability
INTERCEPT	55.20721	2.331955	0.0217
BS	0.143639	0.237738	0.8126
BM	0.737528	1.279080	0.2038
BI	3.453490	4.728317	0.0010
ACS	-1.042485	-0.932389	0.3533
ACI	2.231023	2.719724	0.0077
ACM	-1.558016	-1.586562	0.1157
GD	2.627810	1.970588	0.0515
FS	-0.976968	-1.485766	0.1404
LEV	35.16129	-2.351003	0.0206
EG	0.585407	0.901415	0.3695
IQ	4.216298	1.69288	0.0935
Adjusted R-Squared	0.814588		
F-Statistic	24.87709***		

***denotes significance at 10% level

Board Size and Firm Performance

At 10% significant level, this study reveals that there is no significant relationship between board size and firm performance because the p-value of the variable BS is 0.8126 which is higher than 10%. Hence the hypothesis that there is a negative relationship between board size and firm performance in developing countries is rejected. Despite that existing studies such as Lipton and Lorsch(1992), Jensen (1993), Garcia-Ramos and Garcia-Olalla (2011) and Garcia-Ramos et al. (2017) documented that a larger boards result in lower firm performance, the findings of this research show that larger boards do not lead to lower firm performance in developing countries.

Board Meetings and Firm Performance

The p-value of the variable BM is 0.2038 which is higher than 10%. Therefore, at 10% significance level, there is no significant association between board meetings and firm performance. Consequently, the hypothesis that there is a positive relationship between frequency of board meetings and firm performance in developing countries is rejected. This finding is consistent with Aryani et al. (2017) who argued that board meetings have no significant influence on firm performance. It may be argued that higher number of board meetings in developing countries may not suggest that the board is meeting to discuss strategies to improve firm performance but rather to discuss other matters not related to firm performance such that higher board meetings do not result in better firm performance in developing countries.

Board Independence and Firm Performance

At 10% significance level, the findings of this study reveal a significant positive relationship between board independence and firm performance because the p-value of the variable BI is less than 10% (0.010) and the coefficient of the variable BI is positive 3.453490. Hence the hypothesis that there is a positive relationship between board independence and firm performance in developing countries is accepted. This finding is consistent with the agency theory and also with existing studies such as Kula (2005), Giraldez and Hurtado (2014) and Karayel and Dogan (2016) who documented a positive link between board independence and firm performance. It may be argued that in the context of developing countries, as board independence increases, the board's supervision of managerial performance improves such that managers work more towards shareholders' interests leading to improved firm performance.

Audit committee size and firm performance

The findings of this research reveal no significant association between audit committee size and firm performance at 10% significance level because the p-value of the variable ACS is above 10% (0.3533). Therefore, the hypothesis that there is a negative relationship between audit committee size and firm performance in developing countries is rejected. Despite that many empirical studies (Vafeas, 1999; Sharma et al., 2009; Aldamen et al., 2012; Al-Matari et al., 2012; Qaiser Rafique & Al Mamun, 2015) have documented a negative association between audit committee size and firm performance, the findings of this study show that larger audit committee size does not lead to lower firm performance in developing countries.

Audit committee independence and firm performance

The results of this study reveals a significant positive association between audit committee independence and firm performance at 10% significance level because the p-value of the variable ACI is lower than 10% (0.0077) and it has a positive coefficient of 2.231023. Hence the hypothesis that there is a positive relationship between audit committee independence and firm performance in developing countries is accepted. This finding is consistent with the agency theory as well as with existing studies such as Kallamu and Saat (2014), Barka and Legendre (2016), Mohammed (2018) and Alzeban (2019), who documented a positive association between audit committee independence and firm performance. It may be argued that higher level of audit committee

independence in developing countries is an efficient safeguard against agency cost and it ensures that management takes appropriate financial accounting decisions leading to improved firm performance.

Audit committee meetings and firm performance

At 10% significance level, the findings of this study reveal no significant relationship between audit committee meetings and firm performance because the p-value of the variable ACM is higher than 10% (0.1157). Hence the hypothesis that there is a negative relationship between frequency of audit committee meetings and firm performance in developing countries is rejected. Despite that existing studies such as Barka and Legendre (2016), Glover-Akpey and Azembila (2016) and Koutoupis and Bekiaris (2019) documented a negative association between audit committee meetings and firm performance, the findings of this study show that higher audit committee meetings does not lead to lower firm performance in developing countries.

Gender diversity and firm performance

The results of this research reveal a significant positive association between gender diversity and firm performance at 10% significance level because the p-value of the variable GD is less than 10% (0.0515) and it has a positive coefficient of 2.627810. Therefore, the hypothesis that there is a positive relationship between gender diversity and firm performance in developing countries is accepted. The finding of this study is consistent with the resource dependency theory and empirical studies such as Carter et al. (2003), Julizaerma and Sorib (2012), Sener and Karaye (2014), Conyon and He (2017), Ullah et al. (2020), Fernando et al (2020) who documented that gender diversity improves firm performance. It may be inferred that in the context of developing countries, higher number of female directors on the board enables the board to have greater access to expertise and exceptional information, that can better advise managers in decision-making resulting in better firm performance. Furthermore, women are collaborative, trustworthy and they can bring alternative ideas to solve a problem; hence they can sculpt the strategic vision of the firm and help to improve firm performance (Lincoln and Adedoyin, 2012).

Control Variables

The results of this study also reveal that firm size and economic growth of a country have no significant influence on firm performance at 10% significance level because the p-values of the variables FS and EG are 0.1404 and 0.3695 respectively, which are higher than 10%. Moreover, this research shows a positive link between leverage and firm performance in developing countries because the p-value of the variable LEV is lower than 10% (0.0206) and it has a positive coefficient of 35.16129. In addition, this research reveals a positive association between institutional quality of developing countries and the financial performance of firms operating in such countries because the p-value of the variable IQ is lower than 10% (0.0935) and it has a positive coefficient of 4.216298.

Conclusion, Implications of the Study and Future Work

This research has made an attempt to add to the limited existing literature in the context of developing economies regarding the influence of corporate governance and gender diversity on firm performance. This study reveals that higher level of board independence helps to improve firm performance in developing countries. This may be because as board independence increases, the board's supervision of managerial performance improves such that managers work more towards shareholders' interests leading to improved firm performance. Another interesting finding of this paper is that higher number of female directors on the board helps to improve firm performance in the context of developing countries. This paper also documents that in the context of developing countries, higher independence of audit committee is an efficient safeguard against agency cost and it ensures that management takes appropriate financial accounting decisions leading to higher firm performance. This study also documents that in the context of developing economies, board size, board meetings, audit committee size and audit committee meetings, have no significant influence on firm performance. Based on the

findings of this study a few important implications are drawn. This research has revealed that higher board independence and higher audit committee independence help to improve firm performance. Hence shareholders can consider appointing higher number of independent directors so as to boost firm performance. In addition, this study has revealed that higher number of female directors on board results in better firm performance. Shareholders can also consider increasing the number of female directors on board so as to improve firm performance. The findings of this study can be useful to policy makers of developing countries whereby these countries can contemplate to introduce guidelines for firms to increase the number of independent directors on board as well as on audit committee. Given that the presence of female directors on board is relatively low in developing economies compared to developed economies, developing countries can consider to introduce legislation for firms to have a minimum proportion of female directors on their boards. The focus of this study was on developing countries. Future studies can undertake a comparative study between developed countries and developing countries. Such studies can unveil whether the influence of corporate governance and gender diversity on firm performance differs between developing economies and developed economies.

First Submission: March 20, 2023 **Revision Accepted on : July 14, 2023**

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MICROFINANCE BUSINESS MODEL FOR SUSTAINABLE FINANCIAL INCLUSION: STUDY OF A RURAL COOPERATIVE BANK

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Abstract

Rural cooperatives play a vital role in addressing the interconnected challenges of rural indebtedness and poverty by providing affordable credit to marginalized regions and activities. One such important institutional mechanism is district central cooperative banks (DCCBs), which act as reliable sources of microfinance services for both farm and non-farm sectors. This study examines the microfinance business model of the South Canara District Central Cooperative (SCDCC) Bank, located in South India, and assesses its contribution to advancing financial inclusion. The study employs descriptive research methods to gain insights into the microfinance business model of the SCDCC Bank. Data for the analysis is collected from primary and secondary sources, utilizing both qualitative and quantitative information. The findings reveal that the bank has implemented innovative strategies to reach rural segments that have limited or no access to banking services. Through a range of microfinance-plus services, the bank has successfully reached 500,000 poor households in underserved and unserved areas. Furthermore, the bank has achieved a profitable microfinance business, with a remarkable 100 per cent loan recovery rate from the agriculture and microfinance sectors. These findings hold significant policy implications for commercial, rural, and cooperative banks. They underscore the importance of adopting similar microfinance business models to foster financial inclusion as a sustainable development endeavor.

Keywords: *Cooperative Banks, Microfinance, Financial Inclusion, Rural Development, and Business Model.*

Introduction

Rural cooperative banks and credit institutions play a vital role in addressing the increasing demand for credit in rural areas of India. Historically, cooperatives have provided affordable credit to small borrowers and helped address poverty and indebtedness in rural areas. Over the past century, rural credit cooperatives have demonstrated outstanding growth in geographical and demographic outreach[1], as well as the volume of business. These local-based institutions have been key facilitators of financial inclusion in India.

India's cooperative banking structure encompasses both urban and rural credit institutions, operating under the regulations of the State Cooperative Societies Act or the Multi-State Cooperative Societies Act. The rural cooperative institutions are divided into short-term and long-term structures. Short-term structures include State Cooperative Banks (StCBs), District Central Cooperative Banks (DCCBs), and Primary Agricultural Credit Societies (PACS), operating at different levels from apex to grassroots. Long-term structures comprise at the state level - "State Cooperative Agriculture and Rural Development Banks" and at district level "Primary Cooperative Agriculture and Rural Development Banks". As of the end of March 2021, India had a total of 98,042 cooperatives, with 1,534 Urban Cooperative Banks and 96,508 rural cooperatives. DCCBs specifically

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[1] In terms of geography, cooperative institutions have emerged as essential facilitators of formal financial services in rural areas and small towns. They have effectively bridged the gap, providing access to these services where they were previously limited. From a demographic perspective, cooperatives have displayed a pivotal role in extending formal financial services to customers belonging to low and middle-income groups across rural and non-rural areas.

cater to the financial requirements of the rural population. At the end of March 2021, there were 351 DCCBs in the country, constituting 42.53 per cent of the total assets of rural cooperative credit institutions (RBI, 2021).

While cooperative banking institutions were initially slow to enter the microfinance market through the "Self-Help Group-Bank Linkage Program" (SHG-BLP) in India, they have gradually increased their market share over time. As of March 31, 2022, cooperative banks held a significant portion of the SHGs financial activities. They accounted for approximately 12 per cent of SHGs' total savings, 5.76 per cent of the loans disbursed to SHGs, and 6.29 per cent of the total loan outstanding for SHGs from the banks (NABARD 2022). The cooperative banks were responsible for mobilizing INR 1422.36 million in SHG savings, disbursing INR 2722.75 million in loans, and managing a total loan outstanding of INR 5912.21 million for SHGs by the end of March 2022 (NABARD, 2022).

Although the contribution of DCCBs to SHG formation and micro-financial services for the farm and non-farm sector in India has been momentous (NABARD, 2022), there is a limited number of studies that have examined the "microfinance-business model" adopted by DCCBs and its implications for future microfinance development in India. Therefore, this paper analyzes the microfinance business model of a DCCB from South India, namely the South Canara District Central Cooperative (SCDCC) Bank, and its contribution to promoting financial inclusion. The bank has adopted the innovative approaches in delivering microfinance (credit, deposits, insurance, etc.) and microfinance-plus services (training and skill building, marketing, financial literacy, etc.) in its banking business model.

This paper is structured into six distinct sections to effectively present the research. The second section provides a review of previous studies conducted. Moving forward, the third section outlines the study's objectives and methods employed, elucidating the approach taken to conduct the research. In the fourth section, the focus is specifically on analyzing the microfinance business model of the "South Canara District Central Cooperative Bank" (SCDCCB). The fifth section presents the study's findings and engages in a detailed discussion to interpret and contextualize the results. Finally, the paper concludes by summarizing the key findings and underscoring the policy implications that emerge from the research.

Literature Review

This section presents a review of existing literature on themes related to inclusiveness and Self-Help Groups, the role of cooperatives in SHG-BLP and inclusive finance, the sustainability and profitability of microfinance business models, and the importance of handholding, training, marketing, and insurance services in cooperative and inclusive banking.

Inclusiveness and SHG

Ahmed et al. (2011) used a regression analysis to determine the factors influencing the extent to which the members of microfinance program contributed to their family's income in Bangladesh. The study focused on comparing two groups of rural women: those who had access to credit through micro-credit programs and those who did not. The findings revealed that micro-credit programs played a crucial role in providing timely access to credit for productive activities. Additionally, the study observed a positive correlation between skill development, an increase in women's education level, and the improved social and economic conditions of women. Marar et al. (2009) found that measures such as capacity building are necessary to ensure the sustainability of micro-lending. They noted that long-term and beneficial changes in the livelihoods of women engaged in SHGs should be strengthened by way of capacity-building activities, which would be crucial in the efficient utilization of borrowed money. Karduck and Seibel (2005) noted in their empirical study that transaction costs of SHGs are low and highlighted the high profitability as well as additional financial benefits of SHG banking for its members.

Dasgupta (2001) emphasized the importance of creating sustainable investment opportunities for SHGs in the long run, and suggested that the government should facilitate NGOs in their developmental activities in the

form of Self-Help Promotion institutions. At the same time, banks should be supported in expanding their SHG business. Karpowicz (2016) suggested that collateral constraints need to be lowered to increase growth, and that inequality can be addressed effectively when financial participation costs are kept low. Karduck and Seibel (2005) raised the question of SHG banking as a commercial proposition despite being highly social for the poor.

The authors noted the lack of a nationwide study utilizing a standardized methodology, prompting their investigation into 78 SHGs associated with Regional Rural Banks (RRBs), commercial banks, and PACS operating under the purview of a DCCB in the state of Karnataka. The study revealed that SHG banking proved to be a highly profitable endeavor for banks while also yielding substantial benefits for SHG members. Moreover, the transaction costs associated with SHGs and their members were found to be notably low, with further reduction observed as loan volumes increased.

Role of Cooperatives in SHG-BLP and Inclusive Finance

Shylendra (2013) was carried out a study to identify the challenges that cooperatives encounter in attaining inclusion and sustainability. The research shed light on the limitations faced by cooperatives in effectively leveraging the strengths of the SHG-BLP to achieve these objectives. It emphasized the need for a deeper understanding of the factors hindering the cooperative sector from harnessing the full potential of this program to promote inclusion and ensure long-term viability. Harper et al. (2005) suggested that linking SHGs to PACS instead of DCCB branches was more beneficial for both customers and banks. The paper critically examined the sustainability of SHG lending by DCCBs and found that SHG-bank linkage can be profitable, since SHGs saved more in proportion to their borrowings when compared to other customers. The research findings highlighted a significant observation regarding the Credit-Deposit (CD) Ratio of SHG business across various bank clusters. It was noted that the CD Ratio for SHGs was consistently less than half of that for the four PACS in Bidar. Moreover, the study revealed that SHGs demonstrated a remarkable trend of saving more than twice the amount they borrowed, in comparison to other customers. Based on these findings, the authors strongly recommended the promotion of this business model, recognizing its potential for encouraging savings and contributing to the financial well-being of SHGs.

Patra and Agasty (2013) reiterated that cooperatives were the best option for credit delivery in their study on the cooperative credit system in Orissa. They highlighted the importance of credit counseling, guidance, and developing client capabilities in credit absorption for rural development. Seibel and Dave (2002) examined the sustainability and profitability of SHG-bank linkage and suggested the significance of supervision and fraud prevention rather than regulation for most SHGs. The paper documented the profitability of SHG banking for PACS, public sector banks, regional rural banks, and DCCBs studied, measured in terms of Return on Investment (ROI) and Operational Self-Sufficiency. The authors also highlighted the role of Bidar DCCB's separate Micro Credit Division as a "Self-Help Group Promoting Institution" (SHPI) and the importance of training centers and marketing assistance for the sustainability of SHG business.

Seibel (2009) described the case study of Bidar DCCB, which achieved a commendable position in inclusive financial services. The study noted the importance of training centers specialized in SHG banking and branch-led SHG training facilities, as well as marketing assistance, product design assistance, standardization, packaging, and filling for the sustainability of SHG business. The author underlined the potential role of cooperatives in achieving inclusive outreach and highlights the need for reform in cooperatives to create genuine empowered sustainable organizations that are nurtured and supported.

The contribution of credit cooperatives in agricultural development and rural emancipation has been widely acknowledged in various studies. In their research on the role of cooperative credit in the agricultural development of Andhra Pradesh, Devi and Govt (2012) highlighted the crucial role of credit services in enabling farmers to access the latest technology and achieve higher profitability. The authors also noted the positive economic development effects of cooperative credit for rural people. In a paper analyzing the declining performance

of cooperative banks in the state of Sikkim, Saikia (2015) suggested various measures to improve the situation. These included revisiting the sector with the help of the government and NABARD, focusing on capacity-building efforts, and providing social security.

Empirical evidence also supports the positive influence of higher agricultural loans from cooperative banks on agricultural development in India (Soni & Saluja, 2013). In a case study on the Chandrapur DCCB, Santhanan (2008) described the innovative approach taken by the bank in utilizing Anganwadi workers as SHPI. The locally-based workers have a high level of acceptance among villages and work under the Zilla Parishad, making their support instrumental in developing and credit linking SHGs to the DCCB. The study highlighted the importance of formalizing this approach to ensure the motivation and accountability of the Anganwadi workers. Taken together, these studies underline the significant role of credit cooperatives and cooperative banks in promoting rural development and agricultural growth in India, and highlight the importance of strategic measures to ensure their continued success.

Ensuring Sustainability and Profitability of Microfinance Approaches by Banks

Batra and Sumanjeet (2011) studied various delivery models of microfinance in India, exploring outreach, impact, and sustainability dimensions. The study found that SHG finance supported by NGOs is more efficient in reaching the poor compared to traditional lending. The study also noted that providing suitable insurance with credit has more beneficial outcomes for the poor. However, the World Bank (2004) highlighted key challenges facing the Self-Help Group - Bank Linkage Program initiative. Concerns were raised about sustainability and credibility due to a lesser focus on group quality. Additionally, capacity constraints, the costs of group formation, and interest rates charged by nationalized banks were cited as areas of concern. In terms of actual costs and interest charged, financial viability of the model was also questioned. Similar constraints were observed in the case of SHGs approaching Micro Finance Institutions (MFIs). The study also noted the significance of efforts directed at providing assistance in skill development and marketing for sustainability.

Prof. Mohammed Yunus introduced the Grameen Bank Model in Bangladesh during the 1970s, which gained global recognition for its effectiveness in offering credit to the impoverished. This model incorporates key principles such as strong leadership commitment instilled through training, peer control to prevent negative behaviour, and a strict credit discipline. Seibel and Torres (1999) examined the sustainability of financial outreach approaches to the poor, studying a Grameen model replicator in the Philippines known as the "Centre for Agriculture and Rural Development" (CARD). It was noted that CARD's success demonstrated that the Grameen model was sustainable. Sustainability was measured in terms of financial self-sufficiency ratio, and except for CARD, all other replicators were found to be unsustainable. CARD had some differentiating features such as rural bank status, demand-driven approach, and customized products.

Seibel (2000) studied the successful model of BRI bank in Indonesia, using Return on Assets (ROA) and Return on Equity (ROE) in measuring its performance. The success of BRI's microfinance approach is attributed to its branch network that played a key role in self-help group-bank linkage. Thapa G (2006) reviewed experiences of "microfinance institutions" (MFIs) across various countries on their sustainability and governance. The study noted the significance of strategic vision, organizational transparency, efficiency, and acceptance by shareholders in ensuring sustainability.

Sriram (2005) reviewed the performance and effectiveness of formal financial channels in microfinance. The study specifically emphasized the crucial role played by institutions as social intermediaries in enhancing the performance of the SHG-BLP in states such as Andhra Pradesh. The study explored the success of a pilot branch of Oriental Bank of Commerce (OBC), finding that nurturing SHGs was instrumental in this. Bos and Millone (2015) empirically studied profit maximization and outreach by MFIs, arguing that different institutions should focus on different goals based on their priorities concerning social or financial performance. They found that when MFIs target entrepreneurship development towards women, their efficiency is greater. Puhazhendhi

and Satyasai (2001) conducted an empirical study to evaluate the performance of SHGs with a specific focus on social and economic empowerment. The findings of the study demonstrated that the institutional arrangement of SHGs had a positive impact on the economic and social empowerment of the rural poor, with a more prominent effect on social empowerment.

Microfinance-plus Services for Inclusive Banking

Inclusive and cooperative banking services have been a popular method for providing financial services to underprivileged populations. However, several studies have highlighted the importance of microfinance-plus services (Kumar, 2012; Kumar, 2016; Lensink, et al., 2018) such as handholding, training, marketing, and insurance services to ensure the success of microfinance institutions. Jayashankar and Goedegebuure (2012) conducted a case study of an NGO offering microfinance, which found that marketing strategies designed for SHGs are essential to enhance the loyalty of SHG members and foster micro-entrepreneurship at the grassroots level.

Jain and Tripathy (2011) conducted an empirical study and concluded that micro-enterprise finance through SHGs had not been successful in percolating the core message of socio-economic development in rural areas. The success of Micro-credit approaches was restrained in the absence of bank-led interventions of handholding towards financial literacy, group management, group regulation, and product/marketing-related training and support. Dulamragchaa and Izumida (2011) conducted a study of Mongolian microfinance methods. The study's findings unveiled the advancement of microfinance through the implementation of innovative approaches, particularly the expanded understanding of collateral. By adopting a broader definition of collateral, including various types of assets, and incorporating personal and organizational guarantees, microfinance made significant progress. Furthermore, the study highlighted the effectiveness of field staff visiting customers' homes in accurately assessing their needs and addressing challenges arising from information asymmetry. This approach not only facilitated better understanding of customer requirements but also aided in resolving issues stemming from limited access to information.

Ike (2013) compared the growth in income of beneficiaries of microfinance and non-beneficiaries involved in various business enterprises. A significant difference in income growth was found to be due to the services provided by microfinance institutions. The study recommended that formal training on credit utilization is vital to the growth of such enterprises and should be necessarily provided by microfinance institutions. Jumpah et al. (2018) studied the factors influencing repayment of micro loans among smallholder farmers. The research suggested that MFIs should prioritize providing credit management and investment training to farmers to augment repayment rates. It emphasized the importance of borrowers utilizing the loan for its intended purpose. Additionally, the study recommended that MFIs explore mechanisms to reduce operational costs, ultimately leading to lower interest rates for borrowers. The findings highlight the significance of financial literacy and responsible borrowing practices for farmers, as well as the need for MFIs to streamline their operations for the benefit of borrowers.

Sadaf (2013) studied the SHG Bank Linkage program of State Bank of India in the state of Bihar and noted that focus on marketing of SHG products is required for sustaining micro-entrepreneurship. NGOs can be called upon to partner in this effort. The study also noted the role played by NGOs in establishing better relationships among the deprived populations and bank officials. Mwenda and Muuka (2004) recommended regular visits to deprived people and working in close association with such communities to continue the relationship with existing clients and acquire new clients.

Research Objectives and Methodology

This study aims to investigate the business model adopted by a District Central Cooperative Bank (DCCB) in India's microfinance sector and its implications for sustainable and profitable financial inclusion. The research objectives encompass a comprehensive assessment of the microfinance business model employed by

SCDCCB, specifically focusing on the economics of microfinance operations and its sustainability. Additionally, the study seeks to analyze the strategies employed by the bank in microfinance development and their potential impact on future microfinance initiatives in India. By identifying the various financial and non-financial aspects of the microfinance business model in SCDCCB, the research aims to provide valuable insights and recommendations for enhancing its efficiency, sustainability, and profitability, ultimately contributing towards the deepening and sustainability of financial inclusion in the country.

At the elementary level, the microfinance business model of SCDCCB is defined absolutely in terms of the bank's economic model with a concern for profit generation. At the operational level microfinance business model comprises of design of the internal processes and alignment of infrastructure with the objective of creating value. In this study, we analyze the microfinance business model of the DCCB on the premises of strategy and choice of targeted customer, its value proposition in terms of its product and service offerings, its production and delivery processes and its organization structure to link various stakeholders, and the resultant financial model of the business.

In the state of Karnataka, there are 21 functional DCCBs. The South Canara District Central Cooperative Bank (SCDDCB) is considered one of the best-performing DCCBs due to its 100 per cent recovery of agricultural and microfinance loans. For the past 27 years, the bank has consistently held the top position in the state (SCDCCB, 2023). SCDCCB's growth in terms of share capital, deposits, borrowings, loans outstanding and profit is comparatively higher than the national average. The bank showed high recovery performance with having only 3.12 per cent of NPAs as compared to national average of 9.74 per cent. The bank has reported a very high percentage of share in total deposits, borrowings, loan disbursed and loan outstanding in the state of Karnataka (NAFSCOB, 2021).

The study uses both primary and secondary data of the SCDDCB. Descriptive and analytical research designs are adopted in the study to examine the business model and its operations in SHG lending. Personal interviews were held at the bank with the chairman and board members, senior executives and branch managers. In addition, the interviews of the Chief Executive Officer (CEO) of Navodaya Grama Vikas Charitable Trust (NGVCT) an NGO of the bank, along with its field officers was also conducted. The primary data was gathered using a structured questionnaire. The secondary data of the bank was collected for the period 2014-2015 to 2020-2021 from banks annual reports, NGVCT published and unpublished documents, and from the National Federation of State Cooperative Banks Ltd.

Microfinance Business Model of SCDCCB

The SCDCC Bank implements a microfinance business model to cater to the financial needs of economically marginalized individuals and groups, primarily in rural areas. SCDCC Bank focuses on empowering this target market by offering tailored financial services and promoting financial inclusion. Through a group lending approach, loans are disbursed to self-help groups, fostering collective responsibility and support. The bank emphasizes financial literacy and capacity building, conducting training programs to educate borrowers about financial management and entrepreneurship. This equips borrowers with the knowledge to make informed decisions and enhances their chances of success. SCDCC bank strives to maintain affordable interest rates, ensuring borrowers can repay loans without excessive financial burden. Regular monitoring and support from field officers help strengthen relationships with borrowers and facilitate successful loan repayment. The subsequent sections provide comprehensive discussions on the bank's strategic intent for microfinance business, target customers, products and services, process and organization structure, operational strategy, and economics of the SHG lending program.

Strategic Intent for Microfinance Business

The microfinance business of SCDCCB constitutes a significant 11.4 per cent of its total portfolio,

which reflects the bank's acknowledgement of microfinance as both an opportunity and a corporate social responsibility. The bank is committed to promoting equality and inclusion of underprivileged sections in the mainstream economy, and sees SHGs as a means to help them overcome financial limitations and improve their socio-economic conditions. This is a reflection of the bank's core values. Through the formation of SHGs, the bank has been able to reach out to untapped rural markets, and mobilize deposits (current and savings accounts) and advances (agriculture, retail, micro-enterprises, etc.), thereby enhancing it's connect with the community.

Target Customers

SCDCCB has identified specific customer groups to target for its microfinance business, based on the strength of its institutions and its geographical operations. The bank's focus is on meeting the financial needs of customers in the farm and non-farm sectors, such as marginal farmers, the fishing community, beedi workers, retail fish merchants, agriculture and non-agricultural labourer's (including those engaged in cashew-nut factories), and small and micro-entrepreneurs, among others. These customers are primarily located in the districts of Dakshina Kannada (DK) and Udupi. The bank's product and service offerings are designed to meet the unique financial requirements of these targeted customer groups.

Products and Services

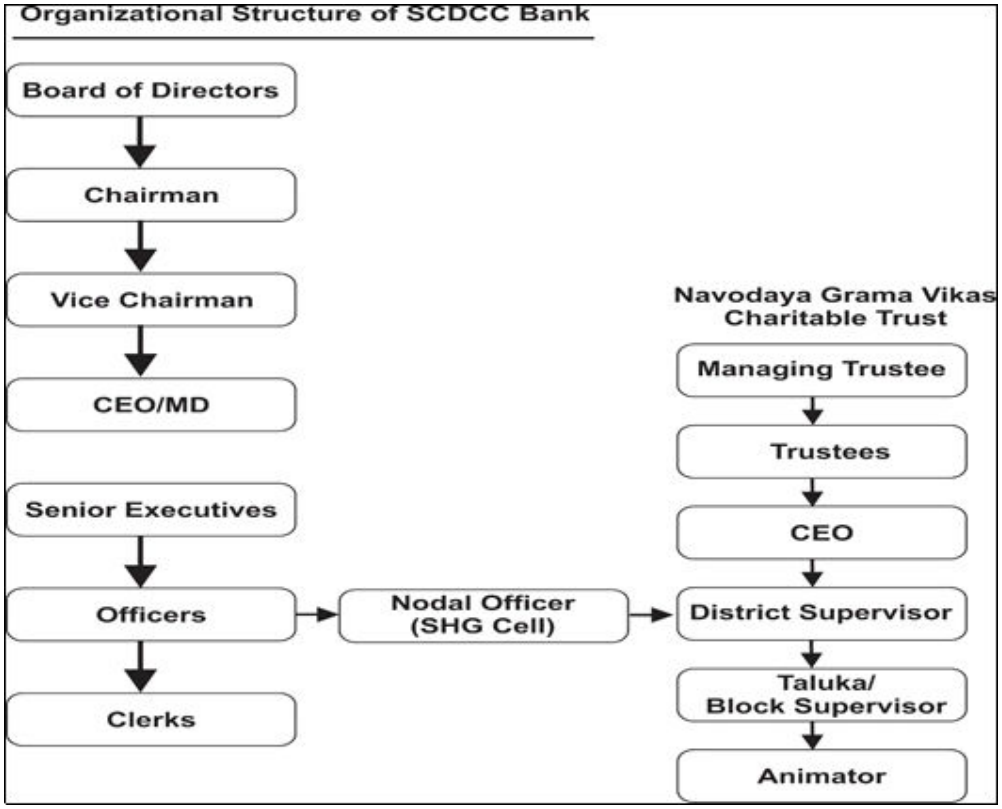
SCDCCB provides a range of savings and deposit products including savings accounts, recurring deposits, and fixed deposits. The bank's loan portfolio comprises term loans, personal loans, and gold loans. It also offers health insurance services to its microfinance clients. In addition to these, SCDCCB provides Rupay debit cards and remittance facilities to its customers.

Process and Organization Structure

The SCDCC Bank has a well-defined organizational structure (Figure 1) in place to efficiently cater to its targeted customer base. The Board of Directors, consisting of a Chairman, Vice-Chairman, 12 Directors, and one state government nominee, oversees the bank's operations. The CEO/MD manages the day-to-day activities of the bank, while two General Managers oversee establishment and loan functions, respectively. The bank has four Deputy General Managers and four Assistant General Managers in charge of various departments, such as planning, branch business, loan, and establishment.

At the corporate level, the microfinance vertical (SHG cell) has a Nodal Officer who exclusively handles the microfinance business. The bank's branches also have a designated SHG cell that works under the guidance of the branch manager. An exclusive official is responsible for the microfinance business at the branch level, with an animator from the Navodaya Trust in the designated villages/hamlets. The officer in charge of the SHG cell at the branches works closely with the taluk and district level supervisors of the Navodaya Trust to ensure timely and adequate microfinance-plus services to its members along with follow-up and recovery of micro-loans.

Figure 1: Organisational Structure of SCDDC Bank



Source: Illustrations by Authors

The SCDCCB established an NGO, the NGVCT, in 2004, to coordinate between the bank and SHGs. The NGVCT forms SHGs, provides help in group management, financial management, facilitates training and guidance for income-generating activities, and provides market linkages, in addition to assistance in savings and credit linkage to the bank. The board of SCDCCB is also the board for Navodaya NGO, headed by a CEO and supported with a team of district and block level supervisors and field level officers (animators). The bank offers a range of products and services, including compulsory savings products such as savings bank accounts and voluntary deposits like recurring deposits and fixed deposits. The bank's primary loan product is term loan, along with personal loans and jewelry loans. Additionally, the bank offers health insurance services to its microfinance clients, Rupay debit cards, and remittance facilities to its customers.

Operational Strategy

To ensure democratic functioning and reach the financially excluded and vulnerable sections of the society, microfinance operations at the 'bottom of the pyramid' are managed through SHGs, overseen by the NGVCT at the bank level. The NGVCT is assisted by district and taluk supervisors, who are supported by animators that work at the grass-root level, linked to different bank branches and PACS. These animators receive four days of training in SHG formation, management, bookkeeping, and information about government schemes for the upliftment of the vulnerable and financially excluded poor.

The animators work at the village level, where they identify potential members for SHG formation by conducting door-to-door campaigns and visiting all households in the village. They ensure that only one member per family is made an SHG member to avoid dual membership. After group formation, SHG members are trained in group management activities through programs provided by NABARD, Krishi Vigyan Kendra (KVK), and Rural Entrepreneurship Development Program (REDP).

Weekly meetings are encouraged, with compulsory savings from members, and an account is opened in the nearby SCDCCB branch. The animator accompanies members for opening the savings account at the bank, and after six months of regular savings, internal lending starts with a group-decided rate of interest on the loan. The animator regularly visits the group and observes the lending process and repayment behavior of the members. If members regularly repay their loans, credit linkage to the bank branch is suggested.

The bank provides term loans for 3-5 years at an interest rate of 13 per cent per annum, with interest subsidies from the government, making the effective interest rate around 4%. Animators help in filling and processing loan applications for SHGs in the branch, which includes individual loan application forms, SHG loan application forms, grading sheets audited by NGVCT and SCDCCB, inter-se agreements, loan agreements, and inspection reports from the bank.

Grading of the group is carried out by animators, supervisors, and officers from the bank using a grading format developed by NGCVT, which includes parameters such as regular attendance and savings repayment. Groups obtaining grades of 80 per cent and above are eligible for credit linkage, while those with less than 80 per cent are regraded after some time. If the grade is less than 60%, the group is ineligible for credit linkage, and NGVCT provides all support and training inputs to the group to improve its grade the next time and get credit access from the bank.

The maximum loan amount is four times the saving amount, but it does not exceed Rs 50,000 per member while sanctioning the loan. Higher loan amounts are given only after considering the maturity of the SHG. All the members are called to a bank branch before loan disbursal so that they know that the loan is disbursed under joint liability. The designated district and block level supervisor undertake scrutiny of the loan application on a daily basis, and the loan application is then forwarded to the credit department of the branch.

Economics of SHG Lending Program

In the microfinance business, understanding the financial model is crucial. Table 1 provides an estimate of the economics of SCDCCB's microfinance operations, including costs, revenues, provisions, and profits.

Table 1: Estimates of Cost, Revenue and Profit for SHG Operations (Amount in Rs Lakh)

Year	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Interest Cost (on SHG Saving Deposits) [A]	151.88	179.36	215.29	262.39	300.82	344.88	395.40
Interest Cost (on Other Funds for SHG Loans) [B]	240.3	254.1	347.17	452.89	530.64	621.74	728.49
Operating Cost of SHG Ops [C]	322.7	296.05	352.33	461.16	504.21	551.29	602.76
SHG Business-Specific Operating Cost [D]	--	--	--	--	--	--	--
Total Cost [E]	714.88	729.51	945.53	1212.18	1383.25	1578.46	1801.22
Interest Earning on SHG Loan [F]	824.43	909.14	1081.6	1346.9	1522.76	1721.58	1946.35
Interest Earning on SHG Deposit SLR Carry [G]	76.48	89.97	110.89	185.99	232.26	290.04	362.20
Recovery [H] (Per centage)	96.88	96.74	96.95	97.06	97.11	97.15	97.20
Write-off for SHG Loan Losses [I]	1.81	1.75	1.64	1.55	1.49	1.43	1.38
Profit (+) / Loss (-) [J]	184.21	267.84	245.33	319.15	366.16	420.08	481.95

Source: Authors calculations based on bank data

Costs on Microfinance Operations

There are three primary cost heads for SCDCCB's microfinance operations: (1) interest cost, which includes interest paid on SHG deposits [A] and interest paid on other sources of funds that have been lent to SHGs [B]. The former is estimated at a 4 per cent interest rate based on the average amount of savings in the

SHG account, while the latter is estimated at an interest rate equal to the bank's cost of funds during the year, as published in the annual report. (2) General operating costs [C], which cover manpower and administrative expenses for running SHG operations. These are estimated by proportioning the total operation cost for SCDCCB to the asset size of the SHG business. (3) Business-specific operational costs. However, there were no such costs found in this study related to SCDCCB's microfinance operations.

Revenues from Microfinance Operations

The bank generates revenues from microfinance operations through interest income from lending to SHGs at 12 per cent per annum [F] and from interests earned on SLR carry [G]. The former is calculated based on the average volume of advances to SHGs for two consecutive years, while the latter is based on the average volume of SLR investments made from SHG deposits for two consecutive years multiplied by the bank's yield on investment (Table 2).

Provisions for Microfinance Operations

Since SHG loans are unsecured, the bank sets aside provisions for the entire amount of non-performing assets (NPAs) generated. However, the bank tries to recover the loans before writing them off. The actual recoveries are reported by the bank in their annual report, which is used to calculate the write-offs.

Profit from Microfinance Operations

The microfinance business of SCDCC bank is a profitable venture. The gross operating profit [J] is calculated as the difference between the total revenues and total costs and provisions of microfinance operations. During the study period from 2014-15 to 2020-21, the bank's profit from microfinance operations increased from Rs 184.21 lakhs to Rs 481.95 lakhs (Table 1). Notably, the loan write-off amount decreased as the microfinance loan portfolio and recovery rate increased. This suggests that the NGVCT, as an intermediary institution, has played a crucial role in enhancing the SHG loan portfolio and recovery rate.

Table 2: Economics of Microfinance Business

Year	Gross NPA		ROA		Operational Self-Sufficiency	
	SCDCCB (As % Bank's Total Loan Portfolio)	SHG Segment of SCDCCB (As % of SHG Loan Outstanding)	SCDCCB	SHG Segment of SCDCCB	SCDCCB	SHG Segment of SCDCCB
2014-2015	4.21	0.67	4.69%	89.13%	124.6%	111.8%
2015-2016	3.12	0.54	0.83%	9.91%	115.0%	122.0%
2016-2017	3.11	0.41	2.18%	15.18%	143.0%	119.0%
2017-2018	4.22	0.47	3.45%	67.22%	132.0%	112.0%
2018-2019	4.24	0.53	4.15%	81.23%	124.0%	128.3%
2019-2020	3.21	0.52	4.65%	98.12%	138.0%	145.9%
2020-2021	4.30	0.81	3.41%	72.13%	122.0%	132.2%
Average	3.77	0.56	3.34%	61.85%	128.37%	124.46%

Source: Authors calculations

Table 2 provides data on the economics of microfinance business of SCDCCB, specifically focusing on Gross Non-Performing Assets (NPA), Return on Assets (ROA), and Operational Self-Sufficiency (OSS). The table also includes the per centages of the SHG segment within the SCDCCB's total loan portfolio and the SHG loan outstanding. The average Gross NPA for the SCDCCB over the period is 3.77%. Gross NPA represents the per centage of loans that are not being repaid, and a lower value indicates better loan quality. The SCDCCB's Gross NPA ranged from a low of 3.11% in 2016-2017 to a high of 4.30% in 2020-2021. Overall, the Gross NPA remained relatively stable, showing no significant increasing or decreasing trend. While, the average Gross NPA for the microfinance business was 0.56%, indicating a low risk and high quality credit portfolio of the SHG business for the bank.

ROA measures the profitability of the business by calculating the return generated on the assets employed. Bank's overall ROA was around 3.34%. The SHG segment's ROA ranged from 9.91% in 2015-2016 to 98.12% in 2019-2020. The ROA exhibited fluctuations over the years, with a slight upward trend in recent years with an average of 61.85%. The average OSS for the SHG microfinance business is 124.46% as against the banks OSS of 128.37%. Operational Self-Sufficiency measures the ability of the business to cover its operating expenses through its own revenue generation. The SHG segment consistently demonstrated stable OSS over the study period.

Findings and Discussion

The microfinance initiatives of SCDCC Bank have gained momentum due to its unique business model characteristics. The return on assets for SHG microfinance business is higher than the total bank business. However, the operational self-sufficiency for microfinance business is low due to high operational costs in managing SHG business through the NGVCT. The study finds that there are several factors that have contributed to the profitable microfinance business.

Microfinance Services

Regarding microfinance services, the bank permits customers to open individual and group savings accounts with a passbook. The bank also provides a term loan facility for a period of 3-5 years with an interest rate of 13 per cent per annum. Customers can enjoy government interest rate subsidies for their loans, resulting in an effective interest rate of around 4 per cent per annum. The maximum loan amount is four times the savings amount but does not exceed total indebtedness to more than Rs 50,000 per member.

Chaitanya health insurance is given to each member with a yearly premium of Rs 250 per member per annum. Microfinance members can pay their premium in the nearby bank branch to the NGVCT's insurance scheme. Premiums are collected in the first month of bank linkage, and members become eligible for Mediclaim benefits after 30 days of premium payment. Family members between the ages of 5-70 years are eligible for this insurance scheme. The policy covers hospitalization (illness or an accident) costs of up to Rs 5,000 for the policyholder. A policyholder can avail Rs 10,000 towards maternity-related expenses. In case an SHG member dies in an accident, the dependent member of the family is paid Rs 25,000. For any permanent disability of a member, the insured gets Rs 25,000, and half of the amount for partial disability.

In addition to health insurance, NGVCT also has a life insurance plan with LIC, "Jeevan Madhura" for the age group of 18-60 years. A policyholder may opt for a 5-15 year policy with a minimum sum assured of Rs 5,000 and a maximum sum assured of Rs 30,000. The flexible premium may be paid weekly, fortnightly, or monthly.

Marketing Approach

SCDCCB is dedicated to nurturing SHG businesses through diverse marketing initiatives, which are discussed in the following sub-sections.

(a) Need-based Approach: The foundation of effective marketing is continuous engagement with target customers. SCDCCB holds regular monthly meetings at the taluk level and quarterly meetings at the head office to review the progress of its microfinance portfolio growth plans. Field level issues are noted and products and services policies are modified accordingly.

(b) Promotion: SCDCCB has adopted a unique approach to microfinance promotion by organizing engagement events for both current and potential SHG clients. These events aim to encourage the proper implementation and propagation of microfinance while also empowering rural communities through skits, demonstrations, and small dramas. The bank celebrates religious and social festivals as opportunities to promote microfinance participation and micro-enterprise products. The bank also recognizes and incentivizes animators based on their performance in group formation, savings and credit linkages, and recovery.

(c) Outreach: A doorstep approach is fundamental to the success of microfinance business at SCDCCB. The bank's animators, or "barefoot bank agents," visit remote and financially excluded households to form groups and nurture a micro-banking unit for financial intermediation. Bank officials also visit SHGs, providing financial literacy training and discussing financial needs and future business and non-business plans to extend banking services.

(d) Non-financial Services: Delivering non-financial services for better utilization of financial services is a unique approach at SCDCCB. The bank partners with NGVCT to reach marginalized segments of society, even those excluded from commercial banks. NGVCT promotes various skill and knowledge development programs, income-generation activities, and market intelligence to ensure productive use of microfinance services and commercial viability of group/individual entrepreneurship activities. SCDCCB also networks with organizations like Krishi Vigyan Kendra, Rural Entrepreneurship Development Program, and NABARD to provide guidance in preparation of bankable (enterprise) project reports and to help borrower's access government financial support.

Another vital aspect of the bank's non-financial services is developing social capital through social networks, trust, and embeddedness. NGVCT forms groups based on the information that peer members have about each other, building trust and promoting sustainable microfinance business. The bank also conducts social, cultural, and religious programs to empower customers on socio-economic wellbeing, which builds community togetherness and creates trusted customer segments. The subsidized health and educational programs enable customers to access both cooperation and commercial borrowing.

The microfinance activity of the bank is viewed as a profitable business venture by the top management, who provide support and guidance through the SHG cell - a dedicated microfinance business vertical at the corporate level. The president of the bank also serves as the president of NGVCT to ensure timely access to both financial and non-financial services. The bank closely monitors its officers and NGO workers on business development, encouraging and incentivizing their contributions towards the bank's growth.

At the branch level, microfinance business strategies encompass a range of activities. A dedicated officer attends to the daily requirements of microfinance clients, including identifying new borrowers, providing basic banking services, rating and processing loan applications, and monitoring repayments and NPA management. The branch manager oversees the microfinance business of the branch, attending SHG meetings with bank and NGVCT officials, building social networks with the community, and aiding in the recovery and growth of the bank's loan portfolio.

Given the dynamic nature of microfinance markets, the bank invests in training to bridge knowledge and skill gaps among employees and PACS. NGVCT staff receive training on participatory rural appraisal and recognizing development gaps, while bank officers undergo training on microfinance business from reputable institutes. Recently, discussions have taken place regarding risk management of microcredit lending. The bank

has adopted unique strategies to manage risk, such as developing a robust Management Information System (MIS) for its microfinance business, actively engaging animators with groups to ensure portfolio quality, and taking precautionary steps like credit counselling and health insurance coverage for all members.

To mitigate credit risk, the bank limits the initial loan amount to four times the compulsory group savings and employs animators who belong to the same locality as borrowers to reduce information asymmetries and moral hazard problems in group lending. Animators' business coverage typically spans two to three villages, minimizing transaction costs for the bank and improving microfinance operations' sustainability. Furthermore, the bank identifies animators in financially excluded villages to expand its microfinance business, leveraging NGVCT interventions in developmental activities to enable brand building and bank penetration. The bank's adherence to these strategies has resulted in nearly 100 per cent recovery in microfinance business over the last 14 years.

Conclusion and Policy Implications

In conclusion, SCDCC Bank's microfinance business model stands out for its uniqueness compared to other commercial, rural, and cooperative banks in India. Rather than relying on external institutions or agencies for microfinance customer identification and bank linkage, SCDCCB focuses on building sustainable small institutions (SHGs) with the help of a social institution like NGVCT. The bank also ensures that its microfinance customers have equal access to all products and services, without any discrimination in terms of access or cost. This commitment to equality and the upliftment of the deprived masses is a core part of the bank's mission.

At the corporate level, the bank's chairman is heavily involved in designing microfinance products and ensuring their delivery and recovery, working closely with officers at all levels and NGVCT. SCDCCB places a strong emphasis on developing social capital, trust, and togetherness through various non-financial services, leading to high levels of participation by microfinance clients and improved social and economic wellbeing. The microfinance-plus services complement the mission of developing the rural poor into empowered, self-reliant citizens who are confident in their financial inclusion and development.

There are still many people who are financially excluded in India, highlighting the need for integrated banking services that are complemented by non-financial services for sustained financial inclusion. Banks and financial institutions must develop social endowments, including social capital and trust, to improve the delivery of banking services and recovery. Participatory banking approaches, like that of SCDCCB, should be encouraged by the government and other banks for larger financial inclusion and development.

First Submission: March 21, 2023 **Revision Accepted on: July 25, 2023**

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DOES THE INCREASE IN RAILWAY SERVICES REDUCE GREENHOUSE GAS EMISSIONS? A STUDY IN THE CONTEXT OF PUBLIC TRANSPORTATION IN INDIA

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Abstract

This study investigates the relationship between expanding rail services and greenhouse gas (GHG) emissions in Indian states. The research focuses on the potential of rail systems to reduce GHG emissions by accommodating more passengers and being more energy efficient. Panel data analysis is used to examine the impact of rail service expansion on GHG emissions in 28 Indian states and 3 union territories from 2014 to 2019. Secondary data sources are utilized to gather information on GHG emissions, rail track kilometers, gross state domestic product, state export share, population density, vehicle registration, and industrial units. The study employs a panel regression model, with rail service expansion (measured by running track kilometers) as the main independent variable, while controlling for factors such as gross state domestic product, state export share, population density, vehicle registration, and industrial units. The analysis aims to determine whether the expansion of rail transport networks leads to a reduction in GHG emissions. The findings of the study support previous research indicating that the expansion of railway networks contributes to increased emission levels. The study highlights the current reliance on non-electric sources in the Indian railway system and the need for greater electrification to reduce emissions. The findings are particularly relevant as the Indian railway system is undergoing significant development, with expansion efforts leading to increased construction activities and emissions.

Keywords: *Rail services, GHG, Public Transportation, Running Tracks, Gross State Domestic Product*

Introduction

Greenhouse gas emissions (GHG), refer to the release of gases into the earth's atmosphere that can trap heat and contribute to the greenhouse effect, leading to global warming and climate change (Jain, 1993; Kannadhasan and Nagarajan, 2023). GHG emissions are primarily caused by human activities, particularly the burning of fossil fuels such as coal, oil, and natural gas for energy production, transportation, and industrial processes (Huisingh et. al, 2015; Nunes, 2023; 2023; Ghosh et. al, 2021; Das and Sharma, 2023). Transportation is a significant contributor to GHG emissions. It accounts for a substantial portion of global emissions, primarily due to the combustion of fossil fuels in vehicles. The main GHGs emitted by transportation are carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) (Von Blottnitz and Curran, 2007; Ramachandra et.al, 2015). In this context, personal vehicles, such as cars and motorcycles, are identified as the chief GHG emitters. In this regard the public transportation emerge as the substitute of personal vehicles. Buses, trains, and trams have the potential to reduce GHG emissions by accommodating more passengers per vehicle. Investing in and promoting efficient and accessible public transportation systems can help reduce the number of personal vehicles on the road and lower emissions (Dirgahayani, 2013; Kanthavel et. al, 2021; Bleviss, 2021).

Transporting people and products through railway is among the most effective and environmentally favourable methods (Song et. al, 2016). Railway services generally have lower GHG emissions compared to

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other modes of transportation, such as road vehicles or air travel. Rail transport is considered more energy-efficient and has lower emissions per passenger or ton of freight carried (Santos et. al, 2010; Isik et. al, 2020; Lin et. al, 2021). Rail services are superior to other modes of transportation in the following ways:

Energy efficiency: Rail systems typically use less energy per capita than cars or airplanes. Trains can transport a lot of people or cargo in one journey while using the least amount of energy possible (IEA, 2020).

Electric traction: Many of the world's railway systems are electrified, which means that the trains are powered by electricity. Electric trains that are powered by third rail or overhead electric lines, emit fewer direct emissions as compare to diesel-fueled cars. A third rail, often referred to as a live rail, electric rail, or conductor rail, is a semi-continuous rigid conductor that is positioned beside or between the rails of a railway track to supply electricity to a locomotive or train. The usage of renewable energy for power can further reduce carbon emissions (Chan et al., 2013; Barbosa, 2019).

Lessening of traffic: By offering a different means of transportation, railways have the ability to lessen traffic on roadways. This can lessen snarled traffic and the related emissions from idle cars (Jiang et al., 2017; Advani et al., 2022).

Long-distance transportation: Freight transportation and long-distance travel are ideal with railroads. Trains can move more people or goods over longer distances than cars or trucks while using less energy, which reduces greenhouse gas emissions (Tomita et al., 2020;IEA, 2022; Kosai et al., 2022).

Table 1: Development of Indian Railways over the period of time

Year	Running Track kms.	Electrified-Running Track kms.	Locomotives		
			Steam	Diesel	Electric
1950-51	59,315	937	8,120	17	72
1960-61	63,602	1,752	10,312	181	131
1970-71	71,669	7,447	9,387	1,169	602
1980-81	75,860	10,474	7,469	2,403	1,036
1990-91	78,607	18,954	2,915	3,759	1,743
2000-01	81,865	27,937	54	4,702	2,810
2010-11	87,114	36,007	43	5,137	4,033
2016-17	93,902	48,239	39	6,023	5,399

Source: indianrailways.gov.in
(https://indianrailways.gov.in/railwayboard/view_section.jsp?lang=0&id=0,1,304,366,554,1964)

Thus, railways emit fewer GHGs than other forms of transportation because they are more energy efficient, electrified, and capable of carrying enormous volumes of passengers or freight. Promoting and funding rail networks can be an efficient way to cut emissions and achieve more environmentally friendly transportation. This motivates us to investigate the connection between rising rail service (public transport) and GHG emissions in Indian states. As of the year 2016-17, out of a total route length of 67,368 kilometers, only 25,367 kilometers were electrified, indicating a significant reliance on non-electric sources. Consequently, the Indian railway system continues to heavily rely on diesel engines, which further intensify the emission levels. To provide some context, in 2016, the Indian railway system comprised 39 steam engine locomotives, 6,023 diesel engine locomotives, and 5,399 electric engine locomotives (Indian Railways, 2017). This data underscores the fact that while progress has been made towards electrification, the railway network is still predominantly dependent on non-electric power sources, thereby contributing to elevated emissions. An electric train typically produces 20-35% fewer

carbon emissions per passenger mile compared to a diesel train, according to Hickman (2012). Despite having begun electrification of its railway system 65 years ago, India still operates less than half of its locomotives using electricity, with approximately 52.2% of Indian railways relying on diesel engines (Times of India, 2018).

Access to Public Transportation:

The average proportion of city dwellers who have Easy access to public transit is shown in the Table 2. This indicator is calculated as the estimated percentage of the urban population that can walk 500 meters (for low-capacity public transport systems, like buses) or 1000 meters (for high-capacity public transport systems, like trains, ferries) along the street network to get to a public transport stop. Only mapped public transportation stops-which may include both formal and informal stops-are included (UN-HABITAT, 2021). It is evident that access to public transit services is still a problem across Africa and Asia.

Table 2: Percentage of Population having easy access to public transport

Regions	Africa	Asia	Europe	World
% of urban population	32	38	92	66

Source: Compiled from UN-HABITAT (2021)

The percentages represent the typical proportion of people who live between 500 and 1000 meters from a high-capacity public transport system (trains, ferries, etc.) and a low-capacity system (bus, tram, etc.). The Table 3 presents the percentage of urban population with easy access to public transportation in selected Asian countries. We develop our own method to classify the Low/Medium and High easy accessibility to public transportation by using UN-HABITAT (2021) data. For this purpose, selected the maxim value i.e., 94.2 and divide it by 3. By doing so we obtained the average value 31.4. Thus, we classify in this way: Below 31.4 - Low Accessibility, 31.4 to 62.8 -Medium Accessibility and Above 62.8 -High Accessibility.

Table 3: Percentage of Population having Easy access to public transport in Asia

Selected Countries	% of urban population Easy access public transportation	Accessibility (Low/Medium/High)
Pakistan	19.96	Low Accessibility
Bangladesh	26.27	
Nepal	27.5	
Indonesia	30.73	
Thailand	32.12	Medium Accessibility
Bhutan	33.46	
Iran	36.85	
India	37.53	
Malaysia	39.58	
Sri-Lanka	45.45	
Myanmar	48.99	
China	50.52	
Japan	56.8	
Singapore	94.2	High Accessibility

Source: Compiled from UN-HABITAT (2021)

These numbers highlight variations in the ease of access to public transportation across the selected countries. With 37.53 per cent of its urban population having easy access to public transport, India has the Second highest rate in Central and Southern Asia, followed by Sri Lanka with 45.45 per cent. Pakistan has the lowest rate, with only 19.96 per cent of its urban population having access. Singapore stands out in Eastern and

South-Eastern Asia, where 94.20 per cent of the metropolitan population has easy access to public transport. Japan comes in second with 56.80 per cent, followed by China with 50.52 per cent. However, with lesser percentages of 32.12 per cent and 30.73 per cent, respectively, than Thailand and Indonesia.

According to above Table 3 Singapore leads all other Eastern and South-Eastern Asian nations in having better access to public transit than Central and Southern Asian nations. The public transport system in Singapore is essential for reducing the city-state's greenhouse gas (GHG) emissions. Singapore has placed a high priority on creating a comprehensive and effective public transport system due to its small land area and dense population (Rahman and Chin, 2011). Singapore encourages locals and visitors to rely less on private vehicles and choose public transportation by offering an easily accessible and effective system. This change in travel habits contributes to a decrease in the number of vehicles on the road, reducing traffic congestion and reducing GHG emissions from the use of private automobiles (Toan and Van Dong, 2019). Similarly, in Central and Southern Asia India is the leading in public transportation and have further prospects to improve the public transportation network.

Review of Literature

Transport emissions, notably carbon dioxide (CO2) emissions, which are the main cause of climate change, are a substantial source of greenhouse gas (GHG) emissions. Fossil fuels like petrol and diesel that are burned in motor vehicles release CO2 into the atmosphere, which aids in the buildup of GHGs and causes global warming (Kopelias et al., 2020; Aminzadegan et al., 2022). Zhang et al. (2018) provides an overview of GHG emissions from various modes of transportation, including railways. It discusses the factors influencing rail emissions, such as energy sources, operational efficiency, and infrastructure. The study highlights the comparatively lower emissions of railways and emphasizes the importance of electrification and renewable energy sources for further reducing emissions. According to Van Fan et al. (2018), road transport accounts for more than 72% of greenhouse gas emissions in the transport sector in the EU. The road is followed by air transport 13.3%, marine transport 12.8%, and railway transport approximately 0.5%. The remainder is attributable to other modes of transportation. Transportation, particularly in the form of air and railways, is a highly volatile sector that contributes significantly to environmental deterioration through carbon dioxide (CO2) and greenhouse gas (GHG) emissions.

Saleem et al. (2018) focuses on the environmental impacts of air-railways transportation in a panel of Next-11 countries (Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, Philippines, South Korea, Turkey, and Vietnam) from 1975 to 2015. It examines the relationship between air-railways transportation, energy demand, bilateral aid flows, population density, and environmental degradation, with a particular focus on carbon dioxide (CO2) and greenhouse gas (GHG) emissions. The study also explores the causal relationships between these variables and their implications for future environmental sustainability. The study confirms the presence of an Environmental Kuznets Curve (EKC) relationship between air-railways passengers carried and per capita income with CO2 emissions. This suggests that as per capita income increases, there is an initial rise in CO2 emissions, followed by a decline, indicating a potential turning point where environmental degradation decreases. However, the relationship between railways passengers carried and GHG emissions shows a U-shaped pattern, indicating that GHG emissions increase initially and then decrease as railways passengers increase. Buses and taxis play a crucial role in urban public transportation in developing countries. However, they also contribute significantly to greenhouse gas emissions and air pollutants. Understanding the environmental benefits and economic challenges associated with fleet conversion is essential. However, limited studies have been conducted, particularly in developing countries. To address this issue, policymakers should consider the introduction of new emissions standard vehicles and alternative fuel vehicles in bus and taxi fleets as an attractive measure for reducing environmental impacts. In this connection Geng et al. (2013) analyzed the cost-effectiveness and environmental benefits of different vehicles in the context of urban public transportation, with a case study conducted in Shenyang, China. The study found that compressed natural gas (CNG) buses exhibited the best overall economic and environmental performance. On the other hand, diesel cars were considered a viable

option for taxis due to the current technology level. Hybrid and electric vehicles demonstrated lower direct emissions, but their embodied emissions (emissions generated during manufacturing and disposal) were higher, making them less suitable for public transportation, especially considering the higher costs associated with these vehicles. The study suggest that to reap the benefit of public transportation in terms of reducing GHG emission an integrated approach is crucial, involving the phased elimination of inefficient vehicles, the adoption of green vehicles, infrastructure improvements, and capacity-building initiatives. It is not imperative that expansion of railways services reduces emission level, as few studies also found inverse relationship too.

Akerman (2011) examines a study that employs a life cycle perspective to analyze Europabanan, a proposed high-speed rail track in Sweden. The study focuses on assessing the potential emission reductions associated with the implementation of this rail project. The study reveals that the implementation of Europabanan can result in substantial emission reductions, amounting to approximately 550,000 tons of CO2-equivalents per annum by 2025/2030. These emission reductions are achieved through two primary shifts: a transition from truck to rail freight and a shift from air and road travel to high-speed rail travel. The findings underscore the significant potential of high-speed rail in mitigating carbon emissions and reducing the environmental impact of transportation systems. It highlights that transportation, particularly personal vehicles, is a major contributor to GHG emissions (Maitra and Sadhukhan, 2013; Bhargava et al., 2018). Public transportation, including buses, trains, and trams, has the potential to reduce emissions by accommodating more passengers per vehicle (Jiang et al., 2019). Previous research indicates that as the economy and public transit development progress, more funding and attention are directed toward public transport, leading to potential reductions in GHG emissions.

From a wide array of research review we can conclude that transport emissions, particularly carbon dioxide (CO2) emissions, are a significant contributor to GHG emissions and climate change. Fossil fuels burned in motor vehicles release CO2, leading to the accumulation of GHGs and global warming. Research has shown that railways have comparatively lower emissions compared to other modes of transportation, emphasizing the importance of electrification and renewable energy sources for further emission reduction.

Objectives of the Study

In this context the objective of the present study is to look into the relationship between public transportation and GHG emission.

Here, railway services expansion is the proxy of railway transportation and also indictor of public transportation. So, the researchers frame the hypothesis as follows:

Null Hypothesis (H0): The railway transportation has no effect on GHG emissions.

Alternative Hypothesis (H1): The railway transportation significantly reduces GHG emissions.

The environmental Kuznets curve was used as the foundation for the aforementioned hypothesis. The relationship between the level of public transportation facilities and carbon emission is an inverted "U" shape (Jiang et al., 2019). The majority of researchers discovered an inverse "U"-shaped association between economic growth and carbon emissions based on the environmental Kuznets curve. The level of development of public transit is said to represent the economy (Jing et al., 2022) and as the region's economic development progresses, more funding is made available for the construction of Public transport facilities in the area.

Methodology

Data source:

The present study relies on secondary data sources to obtain reliable information for its analysis at the state level in India. The response variable data, namely GHG emissions, was extracted from GHG Platform India. Various data sources were utilized to gather information on the explanatory variables. For instance, data

on Running Track Kilometers, which serves as a proxy for railway services expansion, was extracted from different issues (2014-2019) of the Railway Year Book, Ministry of Railways, India. Control variables such as gross state domestic product (GSDP), state export share, and state-wise industrial units data was obtained from various reports and bulletins of the Reserve Bank of India. State-level population density data was extracted from the Office of the Registrar General and Census Commissioner, Ministry of Home Affairs, Government of India, and compiled over a study time period. Additionally, state-wise vehicle registration data was acquired from the Road Transport Year Book, Ministry of Road Transport and Highways of India.

Model specification:

The study spans six years (2014 to 2019) and covers a total of 31 entities, including 28 states and 3 union territories. Given this context, panel data analysis is employed, which involves analyzing data collected over multiple time periods and on multiple entities. In panel data analysis, three commonly utilized models are the pooled model, fixed effects model, and random effects model. To determine the most appropriate model for this study, we conducted tests such as the Hausman test, which compares the fixed effects and random effects models. The results of these tests help us select the most suitable approach for our analysis. The panel regression equation, considering ghg as the dependent variable, res as the independent variable, and gsdp, xs, pd, rv, and indu as control variables, can be represented as follows:

$$ghg_{it} = \beta_0 + \beta_1 res_{it} + \beta_2 gsdp_{it} + \beta_3 xs_{it} + \beta_4 pd_{it} + \beta_5 rv_{it} + \beta_6 indu_{it} + \varepsilon_{it}$$

In this equation, β_0 represents the intercept, β_1-β_6 denote the respective coefficients for each variable, and ε represents the error term. The control variables *gsdp*, *xs*, *pd*, *rv*, and *indu* are included to account for their potential influence on *ghg* emissions while examining the relationship between the independent variable res and *ghg*.

Variables description:

The present study includes a total of seven variables, their descriptions are as follows:

ghg: Green House Emission- Mt CO2e-Million Tonnes of Carbon Dioxide Equivalent, is serving as the dependent variable

res: Running Track Kilometre -The length of all running tracks excluding tracks in sidings, yards and crossings, it is serving as proxy for railway services expansion

gsdp: the Gross State Domestic Product is defined as the entire market value of all final goods and services produced inside the state in a certain time period, usually a year

xs: the state's export share in total country's exports

pd: state-wise population density

rv: state-wise total number of registered motor vehicles in India

indu: State-wise number of factories

Findings from the Study and Discussion

Table 4 presents the descriptive statistics of several variables. These descriptive statistics provide an overview of the central tendency, dispersion, and range of each variable within the sample. The sample mean for GHG emissions is 86.467, with a standard deviation of 94.266. The minimum value observed is -16.36, indicating that in some cases, emissions may have been negative.

Table 4: Descriptive statistics of variables

Variables	Sample number	Mean	Std. Dev.	Min	Max
ghg	186	86.467	94.266	-16.36	312.31
res	186	2996.882	3191.191	0	12563
gsdp	186	4.04e+07	4.23e+07	1126104	2.04e+08
xs	186	317.252	466.171	0	2039
pd	186	1107.344	2568.334	17	11320
rv	186	8107.415	9303.174	137	62634
indu	186	7444.984	9075.985	102	38131

Source: Authors' calculation; Note: the study spans six years (2014 to 2019) and covers a total of 31 entities, including 28 states and 3 union territories. Hence total observations = 31x6 = 186

The maximum value observed is 312.31. The sample mean for running track kilometers is 2996.882, with a standard deviation of 3191.191. The minimum observed value is 0, indicating that there may be instances where no track observed in the sample.

Table 5: Regression Results

Variables	Pooled OLS Regression	Fixed Effect	Random Effect
	DV=ghg		
res	0.0221112 (0.000)	-0.0162967 (0.479)	0.016318 (0.000))
gsdp	-4.15e-07 (0.223)	1.20e-06 (0.004)	6.43e-07 (0.027)
xs	.0957965 (0.000)	.0355093 (0.651)	.0416548 (0.219)
pd	-.0027304 (0.074)	-.0005789 (0.969)	-.0034566 (0.315)
rv	-.0001229 (0.878)	.0001163 (0.810)	.0001601 (0.735)
indu	-.0009007 (0.321)	-.0025644 (0.514)	-.0017967 (0.312)
Constant	17.27572 (0.003)	94.36099 (0.164)	14.29128 (0.280)
Observations	186	186	186
F-value	81.46 (0.000)	2.48 (0.025)	-
Wald Chi-Squared	-	-	97.01 (0.000)
R-square	0.731	0.048	0.714

Source: Authors' calculation

The regression results in Table 5 provide information on the relationship between the dependent variable (DV), which is GHG (greenhouse gas emissions), and several independent variables. The regression is performed using three different methods: Pooled OLS, Fixed Effects, and Random Effects.

For the Pooled OLS regression, the coefficient estimates indicate the effect of each independent variable on GHG emissions. The variable "res" has a coefficient of 0.0221112, which is statistically significant at the 0.000 level, suggesting a positive relationship between "res" and GHG emissions. The variable "gsdp" has a

coefficient of -4.15e-07, which is not statistically significant at the conventional level (0.223), implying that there is no significant relationship between "gsdp" and GHG emissions. Similarly, the variables "xs" and "pd" also do not have statistically significant coefficients (-0.0027304 and -0.0001229, respectively). However, the constant term has a coefficient of 17.27572, which is statistically significant at the 0.003 level, indicating that there is a significant baseline level of GHG emissions even when all the independent variables are zero.

In the Fixed Effects regression, the coefficient estimates for the independent variables are slightly different from the Pooled OLS regression. The coefficient for "res" is -0.0162967, which is not statistically significant at the 0.479 level. The coefficient for "gsdp" is 1.20e-06, which is statistically significant at the 0.004 level, suggesting a positive relationship between "gsdp" and GHG emissions. The variables "xs" and "pd" do not have statistically significant coefficients in this model either. The constant term has a coefficient of 94.36099, which is not statistically significant at the 0.164 level.

In the Random Effects regression, the coefficient estimates for the independent variables also differ from the Pooled OLS regression. The coefficient for "res" is 0.016318, which is statistically significant at the 0.000 level, indicating a positive relationship with GHG emissions. The coefficient for "gsdp" is 6.43e-07, which is statistically significant at the 0.027 level, suggesting a positive relationship as well. The variables "xs" and "pd" do not have statistically significant coefficients. The constant term has a coefficient of 14.29128, which is not statistically significant at the 0.280 level. We further apply Wald Chi-Squared Test, it is a parametric statistical measure to confirm whether a set of independent variables are collectively 'significant' for a model or not. We observed in our random effect model Wald Chi-Squared indicates highly significant with value 97.01.

Overall, the regression models suggest that the variable "res" has a consistent positive effect on GHG emissions, while the impact of other variables (gsdp, xs, pd, rv, indu) is inconclusive as their coefficients are not consistently statistically significant across the different regression methods. The R-squared values provide an indication of the overall goodness of fit for each model, with the Pooled OLS model having the highest R-squared value of 0.731, indicating that approximately 73.1% of the variation in GHG emissions can be explained by the independent variables in the model. The study further applies Hausman test, result of this test only provides guidance regarding the statistical appropriateness of the two models in this particular analysis.

Table 6: Hausman test of panel data

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.24	5	0.814

Source: Authors' calculation

The result in Table 6 presents the Hausman test for panel data. The Hausman test is used to determine whether the random effects model or the fixed effects model is more appropriate for the given panel data. In present model the hypothesis for the Hausman test as follows:

H0: Random effect model is appropriate; H1: Fixed effect model is appropriate

In this case, the test summary shows that the Chi-Square statistic is 2.24, and it is associated with 5 degrees of freedom. The probability value (Prob.) associated with the Chi-Square statistic is 0.814. Based on the test result, since the probability value (0.814) is greater than the conventional significance level of 0.05, we fail to reject the null hypothesis. This indicates that random effect model is appropriate model.

The present study examines the link between the expansion of rail transport networks and greenhouse gas (GHG) emissions. The study emphasizes the advantages of railway services in terms of energy efficiency, electric traction, congestion reduction, and suitability for long-distance travel. The authors argue that promoting and investing in rail networks can be an effective strategy to reduce emissions and achieve more environmentally friendly transportation.

Conclusion and Policy Implications

Since its inception in 1853, the Indian railway system has experienced substantial expansion. The initial 34km passenger route between Bombay and Thane marked the beginning of a journey that has led to the present-day (2018) network of over 120,000km of tracks, making it one of the world's largest rail systems. During the 20th century, electrification gained momentum, with around 4,500km of track electrified between 1980 and 1990, coupled with modernization initiatives. This extensive expansion has enabled Indian Railways to be an integral part of the country's socio-economic fabric, facilitating the movement of goods, services, and people across vast distances and contributing to India's development (Railway Technology, 2018). The study has shown a positive relationship between Railway expansion services and GHG emissions. This indicates as railway services increase in India; it also causes a rise in GHG emissions. Thus, our results are contrary to the earlier studies like Jing et al (2022), Jiang et al (2019), AlKheder (2021) where the relationship turned out is negative.

The findings of our study support the research earlier which demonstrated that the expansion of railway networks contributes to increased emission levels. This is particularly relevant in the case of Indian railways, which is currently undergoing a phase of significant development. The railway services are actively extending their reach to various regions across the country, necessitating the construction of additional tracks, bridges, platforms, and other railway infrastructure. Unfortunately, these construction activities have led to a noticeable rise in emission levels. In order to mitigate these environmental challenges, it is imperative for the Indian railway authorities to prioritize the expansion of electrification efforts. By accelerating the transition from diesel engines to electric ones, a significant reduction in emission levels can be achieved. This transition would not only contribute to a cleaner and more sustainable railway system but also align with India's commitment to combatting climate change and reducing carbon footprints. Therefore, it is crucial for the government and relevant stakeholders to collaborate in driving the necessary investments and implementing policies that promote the widespread adoption of electric engines throughout the Indian railway network.

First Submission: June 14, 2023 **Revision accepted on: September 18, 2023**

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A SYSTEMATIC LITERATURE REVIEW OF FACTORS IMPACTING THE ADOPTION OF AN E-PAYMENT SYSTEM

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Abstract

The study aims to identify the factors impacting the adoption of an e-payment system using a systematic literature review and propose a theoretical model by combining and categorizing factors impacting the adoption of an e-payment system. In-depth literature available has been reviewed using electronic databases such as ACM Digital Library, EBSCO, Emerald Insight, Google Scholar, JSTOR, Science Direct (Elsevier), Springer Link, Taylor & Francis Online, and Wiley Online Library.Out of more than sixteen hundred primary results, twenty-two articles were related to the adoption of an e-payment system. Findings suggest combining and categorizing into two main factors motivational factors and inhibition factors while studying factors impacting the adoption of an e-payment system. It was also observed that most of the studies used a regression analysis. The present study has used secondary data only. The study is useful for conducting qualitative research to understand the impact of constituents onthe adoption of an e-payment system. This is the first attempt to present a comprehensive picture of past studies in the area of the e-payment system and to provide a model impacting the adoption of an e-payment system.

Keywords:*e-payment system, inhibition factors, literature review, motivationalfactors, a theoretical model*

Introduction

Technological advancements become an integral part of people's lives, which led service providers such as banks to seek new and creative ways to offer their services to customers (Lee et al., 2005). The banking sector has adopted technology to offer their services using the Internet such as fund transfers, bookkeeping, and many more (Namahoot & Laohavichien, 2018; Yadav et al., 2015). This has coined this point into the minds of researchers, academicians and practitioners to identify the factors impacting the adoption of an e-payment system (Barkhordari et al., 2016; He et al., 2006; Raon et al., 2021). The first article on the e-payment system was published in The International Journal of Bank Marketingjournal in 1994. Following this, bankers have started thinking to use the Internet for banking services.

The first use of the Internet was found in the USA in 1996 for banking applications, and by the end of 1997, only four central Australian banks offered online banking services to their customers (Sathye, 1999). Similarly, Turkish banks also started offering online banking services to their customers in 1997 (Polatoglu and Ekin, 2001). Following this, the Reserve Bank of India (RBI) started pushing all Indian banks tomodern using computers, and in 1997, the ICICI bank was the first bank in India to adopt e-banking services (Yadav et al., 2015). At present, all types of banks are offering e-banking services to their customers throughout the world. This study concentrates on the e-payment system only from the wide range of services provided by banks using the internet like e-transaction, e-learning, e-banking, e-payment, e-library, e-shopping, and e-registration (Tella and Abdullmumin, 2015).

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Adoption of e-payment systems is increasing day by day which can be found by various research reports 73 per cent of Americans reported using e-payment in 2019 (Pew Research Center, 2019), 78 per cent of respondents in the United States reported using any form of e-payment in 2020 (Statista, 2020), and 64 per cent of respondents in Europe said they used e-payment in 2021 (Visa, 2021). Overall, the World Payments Report 2021 published by Capgemini and BNP Paribas estimated that there were 708.5 billion e-payment transactions globally in 2020 (Capgemini and BNP Paribas, 2021). Even the total number of e-payment transactions in India reached 5.32 billion in July 2021, with a total value of Rs. 7.63 lakh crore as per the report published by the National Payments Corporation of India (NPCI) in August 2021 (NPCI, 2021). The COVID-19 pandemic has added fuel and led people to adopt online banking more compare to the previous year (Bukvic, 2021). A report by Mastercard reveals that e-payments increased by 40 per cent globally in the first quarter of 2021 compared to the previous year (Mastercard, 2021).

We need to understand the basic terminology of e-payment in the word e-payment system. The first definition of e-payment was given by Humphrey et al. (1996) as "payments which are initiated, processed, and received electronically". Similarly, Shon and Swatman (1998) stated, "e-payment is any exchange of funds initiated via an electronic communication channel". Further Abrazhevich (2004) defined two parties involved in e-payment as "e-payment a form of financial exchange that is done between a buyer and a seller and electronic communication facilitates this financial exchange".Sumanjeet (2009) mentioned the use of technology while defining e-payment as "a payment for business, banks and public services of citizens or businesses, which have been conducted through a telecommunications or electronic network supported by modern technology". Similarly, Briggs and Brooks (2011) stated, "e-payment is a form of interconnections between organizations and individuals aided by banks and inter-switch houses that electronically enable monetary exchange".Tella (2012) mentioned that "e-payment is a process of payment made without the use of paper". Chen et al. (2018) stated that "e-payment is the transfer of funds electronically from a payer to the payee through an e-payment platform that enables customers to access and manage their financial transactions through an electronic network".

The first definition of the e-payment system was given by Dennis (2004) as "a form of financial commitment that involves the buyer and the seller facilitated via electronic communications". Further Madhoushi et al. (2005) added that an "e-payment system is a set of regulations that allows users to transfer money". Lim et al. (2007) defined an e-payment system as "any payment system that facilitates secure electronic commerce transactions between organisations or individuals". Gholami et al. (2010) termed the e-payment system as cashless payment because it "is a way to pay for goods and services over the counter via the internet without the use of cash". Similarly, Tella and Abdullmumin (2015)stated that the "e-payment system is a form of a payroll application that the users use in money transactions with other users to effect payment instead of cash".

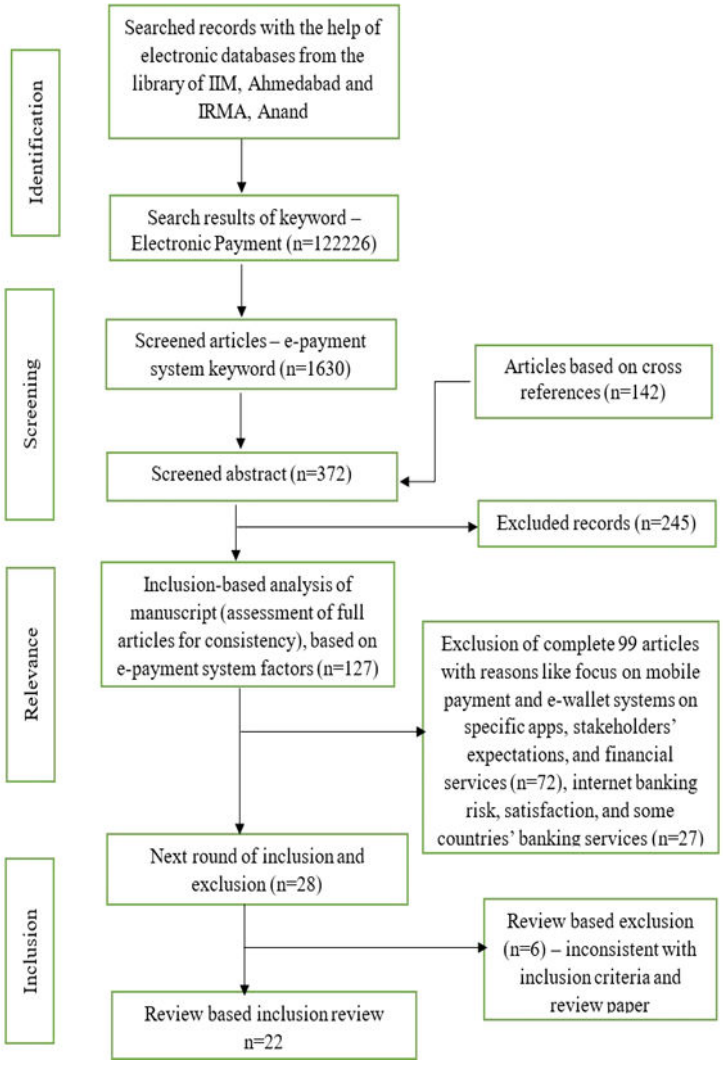
Numerous kinds of research are available in the global context on factors affecting the adoption and acceptance of the e-payment system (Ahmad et al., 2020; Albastaki et al., 2022; Al-Dmour et al., 2021; Alshurideh et al., 2021; Barkhordari et al., 2016; Chen et al., 2021; Ghana and Chandrasekaran, 2021; Gholami et al., 2010; He et al., 2006; Jain, 2022; Lai, 2016; Lai, 2018; Lin and Nguyen, 2011; Nadler et al., 2019; Oney et al., 2017; Oyelami et al., 2020; Ozkan et al., 2010; Rahadi et al., 2022; Raon et al., 2021; Salloum et al., 2019; Teoh et al., 2013; Tomic et al., 2022). Researchers have focused mainly on technical aspects and user acceptancewhile doing research based on e-payment (Albastaki et al., 2022; Ozkan et al., 2010; Raon et al., 2021). The research on the factors impacting the adoption of an e-payment system is evolving day by day withthe addition of factors to the previously researched one. Like the researchers have considered the ease of use, usefulness, security, trust, web assurance seals, awareness, performance expectancy, facilitating conditions, social influence, perceived risk, and complexity as factors impacting the adoption of an e-payment system till 2010 (Gholami et al., 2010; He et al., 2006; Ozkan et al., 2010). Lin and Nguyen (2011) added innovativeness as a factor influencing the adoption of an e-payment system. Following years, researchers have considered optimism, design, insecurity, and discomfort (Ahmad et al., 2020; Lai, 2016; Salloum et al., 2019) and cost

(Tomic et al., 2022) as factors in influencing the adoption of an e-payment system. However, there is a dearth of systematic literature reviews in this area to consider all the factors influencing the adoption of an e-payment system. This motivated researchers to compile all the factors influencing the adoption of an e-payment system by bifurcating factors into motivational factors and inhibition factors to add value and contribute to the existing literature. For this, researchers have reviewed 22 articles by process of a systematic literature review from the initial search result of 1,22,226 on electronic payment. The following section discusses the methodology adopted for this article followed by the findings having factors and sub-factors influencing the adoption of an e-payment system. A proposed theoretical model can be used to conduct quantitative research. This research is a part of the Doctoral work of the first author who tries to identify the factors influencing the adoption of an e-payment system.

Methodology

The study is based on a systematic literature review to find out the factors impacting the adoption of an e-payment system. Relevant articles represent the data in this study. The literature on the adoption of an e-payment system has been analysed and categorised into sub-factors. Following Purohit et al. (2021), the review approach comprises four steps discussion time horizon, database selection, article selection, and article classification (Figure 1).

Figure 1:The search process for articles



Source: The writing style was adapted from (Purohit et al., 2020)

Selection of the paper by time horizon

We have decided to include all the relevant articles till December 2022; hence we have not had any limitation of time while searching the data. The only reason for not having the time restriction is to consider all available research output about the e-payment system. During the process, it has been noticed that the first study on an e-payment system was published in the International Journal of Bank Marketing by Ho and Ng in 1994.

Databases selection

To investigate the studies on the adoption of an e-payment system, we have accessed various electronic databases from the library of the Indian Institutes of Management (IIM), Ahmedabad, and the Institute of Rural Management Anand (IRMA), Anand. We have used electronic resources such as ACM Digital Library, EBSCO, Emerald Insight, Google Scholar, JSTOR, Science Direct (Elsevier), Springer Link, Taylor & Francis Online, and Wiley Online Library. We have considered the articles published in the English language only. The cross-referencing had been done by using Google Scholar. The study does not claim that the databases are exhaustive or full in nature, despite its endeavour to collect all papers on an e-payment system.

Searching and articles selecting process

The searchfor articles was done using the 17 keywords (Table I). Various keywords were used such as 'electronic payment', 'e-payment', 'e-payment system', 'factors impacting e-payment system', and so on. The search process has been explained in the chart (Figure 1). The search was started with the keyword 'electronic payment', which resulted in the output of 1, 22,226. To narrow down the topic of the research, the database is givenan output of 1630 for the keyword 'e-payment system'. The manual screening of articles based on the observation from the title was done. Some studies were omitted as they were discussing 'e-government', 'e-learning', etc. A few articles were not fully available for review. This exercise resulted in the download of 372 articles for further processing.

Table 1: Searching for keywords

Search Keywords	Results
Electronic Payment	122226
Electronic Payment System	71880
Online Payment System	26281
E-payment	2934
E-payment system	1630
Adoption of an e-payment	125
E-payment system factors	110
Factors Impacting of electronic payment system	77
Factors Affecting of electronic payment system	30
Factors Affecting of online payment system	21
Factors Impacting of online payment system	19
Factors Influencing of e-payment system	10
Factors Affecting the e-payment system	10
Factors Impacting the e-payment system	10
Factors Influencing the Adoption of e-payment system	4
Factors Affecting the Adoption of e-payment system	4
Factors Impacting the Adoption of e-payment system	4

Source: Authors' compilation

The next stage involved screening based on the abstract reading of the downloaded articles. At this stage, 191 articles were screened. A totalof 64 articles were excluded from the further process which were focusing on the awareness, benefits, and challenges, of the payment system as well as the literature review and the history of the payment system. This resulted in the output of 127 articles for the further screening process.

The next step involved the reading of full articles for further screening. A total of 72 articles were excluded as those articles were discussing on the mobile payment and e-wallet payment system on the specific apps, stakeholders' expectations, and financial services. Another 27 articles were excluded because those articles were based on Internet banking risk, satisfaction, and country-specific banking services. Six articles were excluded from the review as they focused on satisfaction with the online payment system and checking the paperless efficiency. The last, 22 articles became eligible for the literature review.

Classification of Articles

The available 22 articles were thoroughly studied for further classification. The summary of the reviewed articles (shown in Table II) is prepared with the author's name and year of publication, research design, survey participants, sample size, data collection tools, data analysis techniques used, and key findings. This exercise helped authors to divide articles into two main areas of attention for further write-up.

Table 2: Literature finding summAary

The author(s) name	Research design used	Survey Participant	Sample Size	Data collection approach	Data Analyses	Key Findings
He*et al*., 2006	Descriptive research design,Convenience sampling	Management positions people from China	48	Self-administered questionnaire	Descriptive statistics, SEM, Logistic regression	• Relative advantage, compatibility, trialability, and observability positively affected the adoption of an e-payment system. • Complexity negatively affected the adoption of an e-payment system.
Gholami *et al*., 2010	Descriptive research design, Convenience sampling	Lagos City resident, Nigeria	213	Self-administered questionnaire	Descriptive statistics, SEM, Regression	• Performance expectancy, effort expectancy, social influence, awareness of e-payment, and trust impacted the intention to adopt an e -payment system. • Facilitating conditions had an insignificant impact on the adoption of an e-payment system.
Ozkan *et al*., 2010	Descriptive research design, Quota sampling	Turkey residents	155	Self-administered questionnaire	Descriptive statistics, Regression	• Security and web assurance seals had a positive relationship withthe intention to adopt an e -payment system. • Perceived advantage and usability had a negative relationship with the intention to adopt an e -payment system. • Perceived risk and trust had an insignificant relationship with the intention to adopt an e -payment system.
Lin and Nguyen, 2011	Descriptive research design, Convenience sampling	Vietnam and Taiwan residents	676 (323-Taiwan, 353-Vietnam)	Self-administered questionnaire	Descriptive statistics, correlation, Regression	• Perceived ease of use, perceived usefulness, and level of information on e -payment received by customers positively impacted the use of an e-payment system. • Perceived risk negatively affects the use of an e -payment system.
Teoh *et al*., 2013	Descriptive research design, Convenience sampling	Malaysian residents	183	Self-administered questionnaire	Descriptive statistics, Rotated component matrix, Regression	• Benefits, self -efficacy, and ease of use were significantly associated with consumers' perception towards an e-payment system. • Security and trust were insignificant in the perception towards an e-payment system.

Barkhordari *et al*., 2016	Descriptive research design, Convenience sampling	Tehran residents, Iran	246	Self-administered questionnaire	Descriptive statistics, SEM	• Perceived security and perceived trust were positively associated with consumers' adoption of e-payment systems.
Lai, 2016	Explorative study	Residents of Developed countries (Singapore, Brunei); Developing Countries (Malaysia, Thailand, Indonesia, Philippines); Lesser Developed Countries (Vietnam, Cambodia, Laos, Myanmar)	450	Self-administered	SEM, Regression, Factor loading, RMSEA	• Security, perceived ease of use, and perceived usefulness were positively associated with the consumers' intention to use the e-payment system.
Oney *et al*., 2017	Explorative study, Convenience sampling	Eastern Mediterranean University Students, Famagusta, North Cyprus	299	Personally administered questionnaire	Descriptive statistics, SEM, Regression	• Perceived security and perceived trust had a positive relationship with the use of e-payment systems.
Lai, 2018	Descriptive research design, Convenience sampling	Southeast Asian residents	560	Self-administered questionnaire	Descriptive statistics, Regression	• Enjoyment, perceived usefulness, and perceived ease of use were positively associated with consumers' intention to utilize an e-payment system.
Nadler *et al*., 2019	Descriptive research design, Convenience sampling	College students in China	315	Self-administered questionnaire	Descriptive statistics, Multicollinearity, Regression	• Perceived benefits, self-efficacy, perceived quality, trust, age and gender were significant predictors of usage of an e-payment system.
Salloum *et al*., 2019	Descriptive research design, Convenience sampling	Students of six different universities in the UAE	289	Self-administered questionnaire	Descriptive statistics, Regression	• Perceived benefits and performance expectancy positively correlated with students' intention to use an e-payment system. • Perceived security/privacy and perceived risk negatively affected students' intention to use an e-payment system. • Trust had an insignificant relationship with the students' intention to usean e-payment system.
Ahmad *et al*., 2020	Descriptive research design, Snowball sampling	Pakistan residents	266	Self-administered questionnaire	Descriptive statistics, SEM, t-test,Factors loading	• Perceived ease of use and perceived usefulness had a positive relationship with the adoption of an e-payment system.

Oyelami*et al*., 2020	Descriptive research design, Cross-sectional survey	Banks' customers of Lagos State, Nigeria	50	Self-administered questionnaire	Descriptive statistics, Factors extracted, regression	• Awareness, convenience, safety and security, trust and social influence were positively associated with the adoption of an e-payment system.
Alshuridah *et al*., 2021	Descriptive research design, Convenience sampling	University staff, students, and consumers of the UAE	850	Self-administered questionnaire	Descriptive statistics, Regression	• Trust, perceived usefulness, and perceived ease of use have anticipated the significance of consumers' intention to use the e-payment system.
Al-Dmour *et al*., 2021	Descriptive research design, Convenience sampling	Jordanian banking customers	487	Self-administered questionnaire	Descriptive statistics, multicollinearity, Regression	• Perceived usefulness, ease of use, security, self-efficacy, and trust have positive relations with the intention to adopt an e-payment system.
Chen *et al*., 2021	Descriptive research design, Convenience sampling	Students and staff of Ain Shams University in Cairo, Egypt	175	Self-administered questionnaire	Descriptive statistics, Correlation, Regression	• Incentives, Perceived usefulness, perceived ease of use, perceived risk, perceived trust, and social influences were found to be significant for all different measures of adoption of an e-payment system.
Ghana and Chandrasekaran, 2021	Descriptive research design, Convenience sampling	Residents of Madurai district, India	250	Self-administered questionnaire	Descriptive statistics, Regression	• Trust, Perceived Usefulness, and Perceived ease of use have positively influenced the intention to use the e-payment system.
Raon *et al*., 2021	Descriptive ross-sectional research design, Convenience sampling	Marketing department employees of the Philippines	83	Questionnaire adapted	Descriptive statistics, Normality test, Correlation	• Risk, trust, security, use of web assurance seals, perceived usefulness, and perceived advantage were inadequate to determine its relationships to adopt an e-payment system.
Albastaki*e t al*.,2022	Descriptive research design, Convenience sampling, Purposive sample	The payment services customers in the Kingdom of Bahrain	531	Self-administered questionnaire	Descriptive statistics,Regression, Factors ranking	• Data security, trust, ease of use, usefulness and accessibility have a significant influence on the customer's acceptance of an e-payment system.
Jain, 2022	Descriptive research design, Convenience sampling	Users of Internet banking in India	259	Self-administered questionnaire	Descriptive statistics, SEM	• Perceived trust had a positive relationship with the use of an e-payment system. • Technical protection and perceived security had an insignificant relationship with trust in the e-payment system.
Rahadi *et al.,* 2022	Descriptive research design, Convenience sampling	Gen. Z e-payment users in Malaysia	667	Self-administered questionnaire	Descriptive statistics, SEM	• Facilitating conditions, performance expectancy, and social influence impacted the actual usage of an e-payment system.
Tomic *et al*., 2022	Descriptive research design, Convenience sampling	Serbia residents	457	Self-administered questionnaire	Descriptive statistics, SEM, Regression	• Performance expectancy, perceived security, trust, social influence, convertibility, and financial cost have significant effects on the intention to use an e-payment system.

Source: Authors' Compilation

Findings

This systematic literature review aimed to identify factors impacting the adoption of an e-payment system. The 22 articles filtered from the rigorous literature review were reviewed to identify and group the factors impacting the adoption of an e-payment system. All research papers were categorised in the first stage of the coding process according to the study's central factors such as motivational factors and inhibition factors. In the following stage, axial coding was used, to identify shared sub-factors that connected the relationship between factors. During this stage, researchers developed a basic sub-factors classification for articles, and information from each sub-factors was used in the final stage of selective coding. The following section discusses these factors and sub-factors in detail.

Motivational Factors

Motivational factors mean the factors which are positively impacting the adoption of an e-payment system. The Motivational factors have various sub-factors namely, ease of use, usefulness, security, trust, web assurance seals, awareness, performance expectancy, facilitating conditions, social influence, innovativeness, optimism, and design.

3.1.1. Ease of use. Ease of use means "a person believes that using an e-payment system would be free of effort" (Davis, 1989). Many researchers stated that the ease of use is the combination of various words such as usability (Barkhordari et al., 2016; Lin and Nguyen, 2011; Ozkan et al., 2010; Raon et al., 2021), perceived trialability (He et al., 2006), effort expectancy (Gholami et al., 2010; Lin and Nguyen, 2011; Rahadi et al., 2022), and incentives (Chen et al., 2021). Gholami et al. (2010) stated that consumers learn to use an e-payment system easily, clearly, and it's user-friendly. An e-payment system is an ease of navigation, a one-click approach, and authentication (Ghana and Chandrasekaran, 2021; Ozkan et al., 2010; Raon et al., 2021; Rawashdeh, 2015). Some researchers stated that an e-payment system is easier to use, less complex, free of effort, and friendly to consumers (Albastaki et al., 2022; Lin and Nguyen, 2011; Teoh et al., 2013; Nadler et al., 2019). E-payment system is an effortless, straightforward to use, one-button touch process, single sign-on, just tap-and-go system, easy to register, easy to activate, easy to understand, and easy to pick up the skill (Lai, 2016; Lai, 2018). Alshurideh et al. (2021) stated that an e-payment system helps consumers to get information regarding the history of payment, and payment due, and to improve the performance of the banking system. Al-Dmour et al. (2021) stated that the e-payment system is an easy-to-learn process, which is clear, understandable, and easy to become skilful. Lastly, an e-payment system is flexible in nature (Rahadi et al., 2022; Tomic et al., 2022).

3.1.2. Usefulness. Usefulness regarding the e-payment system means "the degree to which a person believes that using an e-payment system would enhance his or her performance" (Davis, 1989). Usefulness is a combination of various words such as perceived quality (Lai, 2016), technical procedure (Barkhordari et al., 2016), transactional procedure (Barkhordari et al., 2016), and perceived compatibility (He et al., 2006; Lai, 2016). He et al. (2006) stated that the e-payment system fits with consumers' needs and styles, easily reduces conflict, and complements service. An e-payment system is useful in nature and reduces the incurred cost (Al-Dmouret al., 2021; Chen et al., 2021; Lin and Nguyen, 2011). The e-payment system provides the facilities such as acquiring and verifying passwords when consumers log in, changing the payment information before completing the final step of the transaction, displaying transaction summary, confirmation disclosed, accurate, and confirmation sent to users (Barkhordari et al., 2016; Jain, 2022; Oney et al., 2017). An e-payment system completes tasks fast, improves quality, with greater control, makes task useful, support the critical aspects, and is comfortable to use (Ahmad et al., 2020; Albastaki et al., 2022; Alshuridehet al., 2021; Ghana and Chandrasekaran, 2021; Lai, 2016; Lai, 2018). Nadler et al. (2019) stated that the e-payment system is an easy learning process and provides better quality services.

3.1.3. Security. In the payment system security is an important part. All the consumers first show security, because the majority of the consumers don't want to take a risk while paying someone online. Security for an e-payment systemisdefined as "protecting the details of transactions and customers from internal and external fraud/criminal usage" (Ozkan et al., 2010).Researchers stated that an e-payment system protects the details of transactions and does not worry about malicious invasion (Barkhordari et al., 2016; Jain, 2022; Ozkan et al., 2010; Raon et al., 2021; Teoh et al., 2013; Tomic et al., 2022; Yap et al., 2010). An e-payment system provides required advice for preserving security and introducing policies to consumers (Barkhordari et al., 2016; Oney et al., 2017). The e-payment system provides safety, reliability, authorization, encryption, non-repudiation, and confidentiality to consumers (Albastaki et al., 2022; Lai, 2016; Nadler et al., 2019; Salloum et al., 2019). When consumers used an e-payment system they do not need to fear the hacker, just because the e-payment system provides high security to consumers (Al-Dmour et al., 2021; Oney et al., 2017; Yap et al., 2010). Oyelami et al. (2020) stated that the risk of physical cash movement is higher than the electronic mode, a financial transaction is better electronically, transactions making secure, and gives a guarantee to consumers regarding the privacy of financial consumption.

3.1.4. Trust. Trust in terms of an e-payment system means "the consumer's confidence that their money and personal information will not use against their personnel interest" (Ozkan et al., 2010). Trust also plays an important role in the adoption of an e-payment system (Lim et al., 2007). Trust is more vital than security (Tsiakis and Sthephanides, 2005). Gholami et al. (2010) stated that the e-payment in shops, and on the Internet is trustworthy, and also added that it's secure. An e-payment system is free to give out personal information when consumers transacting online, it's trustworthy and increases users' confidence (Albastaki et al., 2022; Barkhordari et al., 2016; Ozkan et al., 2010; Roan et al., 2021; Tomic et al., 2022). Consumers have a belief, integrity, ability, and lower risk in the e-payment system (Nadler et al., 2019; Salloum et al., 2019). An e-payment system is reliable, comfortable, vulnerable to intruders or hackers, and sends money to the correct recipients (Alshurideh et al., 2021; Oyelami et al., 2020).

3.1.5. Web assurance seals. Hoffman et al. (1999) mentioned that "the way to reduce consumers' perceived risk is to use seals approved by trusted third parties". Web assurance seals help to reduce hackers, fraud, and theft of personal data. Many assurance seals services are available to protect consumers' data such as BBB online, McAfee Secure, Verisign, TRUSTe Certified Privacy, Web Trust, Trust Guard, and many others to protect the data of the users (Ozkan et al., 2010). These types of software increase the number of users of an e-payment system. Researchers stated that the use of an e-payment system will be increased with third-party assurance seals and linking of an e-payment system with third-party certifying bodies (Ozkan et al., 2010;Raon et al., 2021; Rawashdeh, 2015).

3.1.6. Awareness. Awareness is defined as "having knowledge or cognizance of something" (Gholami et al., 2010). Awareness is an important part of any technology adoption. Awareness is also related to the information (Gholami et al., 2010; Oyelami et al., 2020), personal past- experience with the e-payment system (Oney et al., 2017), and perceived observability (He et al., 2006). An e-payment system gives beneficial information about the use of the e-payment system, results from apparentness, and is easily understandable (Gholami et al., 2010; He et al., 2006). An e-payment system provides the process of information, features, benefits or operation of the system, and increased knowledge about the system (Lin and Nguyen, 2011). When consumers have considerable experience in ordering a product/service from the web and doing payments via e-payment over the internet it increases the use of the e-payment system (Oney et al., 2017). Oyelami et al. (2020) stated that information regarding the e-payment system is readily available on social media which become skilful.

3.1.7. Performance expectancy. Performance expectancy refers to "the users of the e-payment systems' expected benefits and individual hopes"(Venkatesh et al., 2003). Researchers found that an e-payment system is easy to learn, easily accessible, saves time and money while using, one-click process, diminishes duplication of form filing, helps to pay anytime and anywhere, and it's cost-effective for the consumers (Albastaki et al., 2022;

Ozkan et al., 2010; Raon et al., 2021). Lai (2018) added that the e-payment system is stress-free for the consumers, does not require the physical appearance of consumer the bank, is 24*7 hour available, andit's accessible by differently-abled people as well. An e-payment system incurred economic benefits to consumers such as cash-back offers and other types of discounts they receive (Salloum et al., 2019; Nadler et al., 2019). The study by Oyelami et al. (2020) identified that consumers feel differently while using an e-payment system such as financial information through mobile computing devices, the feeling of happiness, and frustration of banking hall transaction congestion is reduced, the limit of cash movement, and less time consumption. Lastly, an e-payment system is an effortless process (Rahadi et al., 2022; Tomic et al., 2022).

3.1.8. Facilitating conditions. Facilitating conditions are defined by Venkatesh et al. (2003) as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the e-payment system". Researchers stated that facilitating conditions are the internal and external factors that make it easy for people to use a new system or technology, including having the necessary tools and skills, as well as a supportive organizational and technological framework (Gholami et al., 2010; Rahadi et al., 2022). Further, they added that the previous experience of users with similar technologies will help them to adopt an e-payment system easily.

3.1.9. Social influence. Venkatesh et al. (2003) defined "the degree to which an individual perceives the importance of others believes that he or she should use e-payments". Social influence was termed as the subjective norm (Fishbein and Ajzen, 1975) and self-efficacy(Gholami et al., 2010; Oyelami et al., 2020; Teoh et al., 2013; Rahadi et al., 2022). Researchers revealed that many users are using the e-payment system just because they feel confident, they heard about it, someone personally recommended it, influenced by other people, and their friends introduced it (Al-Dmour et al., 2021; Ghana and Chandrasekaran, 2021; Gholami et al., 2010; Rahadi et al., 2022; Teoh et al., 2013; Tomic et al., 2022). Chen et al. (2021) and Nadler et al. (2019) found that users are using the e-payment system because they have experience, verbal persuasion, observation of others' successes and failures, perception of using, and individual affective or emotional state. Lastly, Oyelami et al. (2020) believe that people are using e-payment because it's a trend in society.

3.1.10. Innovativeness. Kim et al. (2010) defined Innovativeness means "a consumer's predisposition to try out new information technologies rather than remain using previous choices". Researchers found that many users have adopted the e-payment system because it's innovative and new in nature, users loved to learn new technology, users are willing to take a risk, and try out new information (Lin and Nguyen, 2011; Humbani and Wiese, 2019). Ahmad et al. (2020) stated that the users use the e-payment system because it's related to new technology, provides new high-tech services, latest, most advanced, mentally stimulating and learns new things.

3.1.11. Optimism. Optimism refers to "the hopefulness and confidence that the new technology will enhance users' personal lives" (Parasuraman and Colby, 2015). Researchers found that the consumers using an e-payment system have a better quality of life, freedom of mobility, control over their daily lives, are productive, fit their own needs, are efficient, and up to date (Ahmad et al., 2020; Humbani and Wiese, 2019).

3.1.12. Design. Design refers to "the increase in the attraction of consumers toward the use of the e-payment system" (Szymanski and Hise, 2000). Lai (2016) and Lai (2018) revealed that many users are using the e-payment system because it has different features such as one single platform, multi-function, single log-in process, single touch and go, customised applications available, no repetitions, simplified operations, and task clarity.

Inhibition Factors

The Inhibition factors means those factors which negatively impacted the adoption of an e-payment system. The Inhibition factors have various sub-factors namely, insecurity, discomfort, perceived risk, complexity, and cost.

3.2.1. Insecurity.According to Parasuraman and Colby (2015), insecurity means "the suspicions that consumers have regarding the new technology, in terms of its possible failure to deliver the expected benefits and its possible harmful effects". Researchers found that when consumers use the e-payment system they are worried about different things such as their personal information being misused, less confidence in the system, use carefully it's dependent, reduces personal interaction, spying, and automated processes (Ahmad et al., 2020; Salloum et al., 2019).

3.2.2. Discomfort.According to Parasuraman and Colby (2015), "the perceived feeling of uneasiness regarding the consumers would be the ability to use and control the new technology to their advantage could slow down the adoption of an e-payment system". Ahmad et al. (2020) revealed that the e-payment system provides less technical support, is not helpful to users, is not for ordinary people, needshigh-tech service and gadgets, is not safe for users, needs a lot of extra features, and they have don't have much information regarding the technology.

3.2.3. Perceived Risk. Baur (1960) defined perceived risk as "a combination of uncertainty about service plus the seriousness of the outcome involved in its usage". Pavlou (2003) simplified this definition of perceived risk "as the direct effect in the e-payment transaction of users' adoption intention". Previous researchers identified a total of eight types of risk such as financial, performance, physical, psychological, social, time-loss, economic, and privacy (Lin and Nguyen, 2011; Ozkan et al., 2010). Researchers found that people are thinking that there are many risks involved while using an e-payment system such as the possibility of stealing the password, consequences associated, occurrence of unauthorized transactions, delays in the processing of payment/received money, and fraud/theft (Ozkan et al., 2010; Raon et al., 2021). Further to this, people avoid using an e-payment system because of fear of losing money and their personal information being manipulated or misused without their knowledge (Lin and Nguyen, 2011; Salloum et al., 2019). Recently, Chen et al. (2021) stated that an e-payment system is a combination of uncertainty.

3.2.4. Complexity. Complexity means "the extent to which the innovation is perceived as difficult to understand or use" (Mauro and Afonso, 2007). He et al. (2016) revealed that the e-payment system is complex in nature, has a difficult setup, difficult to maintain and operate, takes a lot of effort, and it's complicated

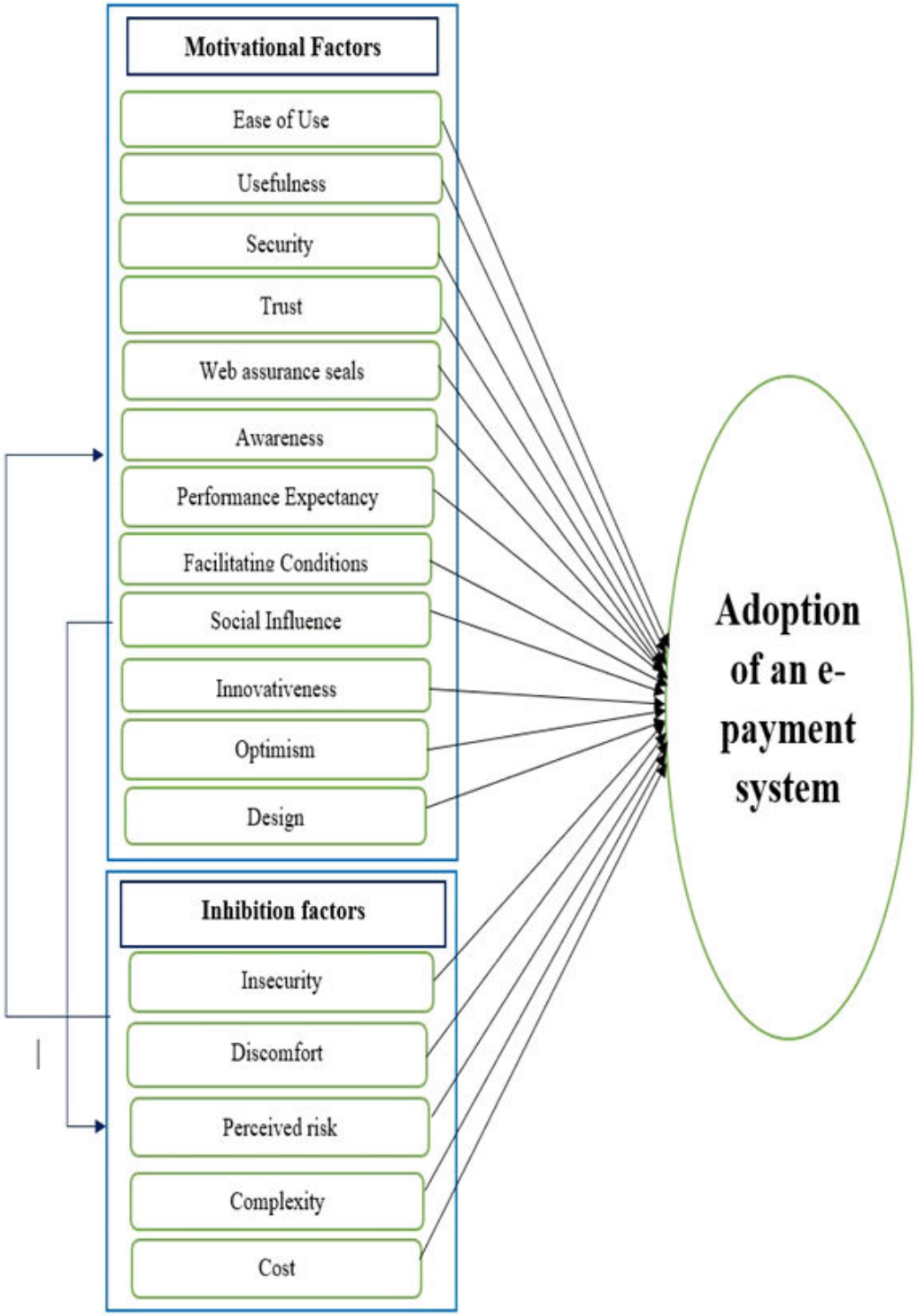
3.2.5. Cost. Tomic et al. (2022) defined cost as "payment for access to a particular system (if any), subscription (if any), collection of service fees and conversion costs".Tomic et al. (2022) revealed the decline in the adoption of an e-payment system because it's costly, as it involves e-transaction charges. Further, he adds that the cost was the top-most reason for the non-adoption of an e-payment system, especially for low-income population groups of people.

Proposed Theoretical Model

The factors that were previously mentioned can be utilized to create a model for the adoption of e-payment systems. The detailed literature review helped authors to identify and separate each sub-factors intogroups based on its nature viz. motivational factors and inhibition factors. Motivational factors are positively impacting the adoption of an e-payment system having sub-factors such as ease of use, and usefulness (Albastaki et al., 2022; Al-Dmour et al., 2021; Ahmad et al., 2020; Ghana and Chandrasekaran, 2021; Lai, 2016; Lai, 2018; Lin and Nguyen, 2011), security (Albastaki et al., 2022; Al-Dmour et al., 2021; Jain, 2022), trust (Albastaki et al., 2022; Al-Dmour et al., 2021; Barkhordari et al., 2016; Ghana and Chandrasekaran, 2021; Jain, 2022; Oney et al., 2017; Oyelami et al., 2020), web assurance seals (Ozkan et al., 2010), awareness (Gholami et al., 2010; Oyelami et al., 2020), performance expectancy (Rahadi et al., 2022; Salloum et al., 2019), facilitating Conditions (Rahadi et al., 2022), Social Influence (Oyelami et al., 2020; Rahadi et al., 2022), innovativeness, optimism (Ahmad et al., 2020; Lin and Nguyen, 2011), and design (Lai, 2016; Lai, 2018). Inhibition factors negatively impacting the adoption of an e-payment system have sub-factors as insecurity and discomfort (Ahmad et al., 2020), perceived risk (Lin and Nguyen, 2011; Salloum et al., 2019), complexity (He et al., 2006), and

cost (Tomic et al., 2022). We propose the model (Figure 2) to study the factors impacting the adoption of an e-payment system.

Figure 2: Proposed Theoretical Model



Source: Authors' compilation

Discussion

In the recent era, technology is more developed. After the COVID-19 pandemic, many people are adopting an e-payment system. The e-payment system has many benefits to the users and the government. The present study explored two factors Motivational factors and Inhibition factors through a systematic literature review by considering available literature from all over the globe from various countries. Adoption of an e-payment system is helpful to the users such as saving time, saving extra costs, not needing to visit the bank frequently, being available 24*7 hours, and many more things. And also, the e-payment system is helpful for the government to reduce black money, reduce tax evasion, improve the economy, and many other things that are helpful to increase the adoption rate of an e-payment system.

Predominantly, the study result explored the Motivational factors for the adoption of an e-payment system. Users are always shown the benefits of any technology while they are adopting it. The perception of users is the ease of use compared with the other payment system. The e-payment system has many uses such as, it being accurate, anytime-anywhere available, and personal information and income information not revealed. The e-payment system also provides security and safety to the users. It's trustworthy for the users, and many web and software are available to protect the data of the payments. Users are also aware of the e-payment system; they show that it gives long-term benefits and is flexible in nature and like a click-mouse. Many users are influenced to adopt the e-payment system, through society, or their important people like friends, family, and relatives. It's based on new technology; many users have used the e-payment system to try out something new. It gives confidence to the users and a better-quality life.

Furthermore, this research study found the Inhibition factors. Many variables are negatively impacted like that many people decline to adopt the e-payment system. Some people fear that their income and personal information will be revealed and that third parties hack the data and misuse it. Many people are not comfortable with new technologies, they are thinking it's highly technical, and not useful for them. Some people have anxiety to use the e-payment system. Many people are not used because they think it's costly and complex. The majority of users decline to use it because of the risk. Risks like privacy revealed, fraud, theft, hacking of their data, and password stealing.

The main strength of this study is that it analysed and combined all factors that impact the adoption of e-payment systems. This is the first of its kind to identify, combine, and categorize the factors based on the positive and negative impact on the adoption of an e-payment system. We have proposed a theoretical model which can be used to investigate the extent of factors impacting the adoption of an e-payment system. This study has practical implications for various stakeholders such as bankers, policy-makers, financial academicians, and educators. The findings can assist these individuals in making informed decisions regarding e-payment system policies and strategies to increase user adoption. Moreover, the study's insights can help financial academicians and educators to expand their understanding of the e-payment system by including additional factors. If people become aware of the benefits of the e-payment system and overcome inhibition factors, it could have a positive impact on the economy and users alike. It may even lead to a future where people no longer carry cash in their pockets.

According to the study, service providers should focus on enhancing security measures for user protection and offering additional benefits to users and organizing awareness programs and incorporating e-payment education into the curriculum could increase the adoption rate of the e-payment system by implementing these recommendations, service providers can encourage more users to adopt the e-payment system (Al-Dmour et al., 2021;Ho and Ng, 1994; Sathye, 1999).

Limitations and Future Study

The current study has several drawbacks as well. Government publications were not considered in this

research as they on concentrate the entire payment system. Even the analysis used peer-reviewed research papers and articles only. Although this study tried to utilize as many keywords as possible to search the literature, it's possible that some pertinent studies were missed if they weren't available or if they were available in a language other than English. Future researchers can use the studies conducted or available in another language also. The proposed model may suffer from the integration point of view as we have combined factors based on the review. Future researchers can use the model to identify, and re-arrange the sub-factors to know the impacting factors impacting the adoption of an e-payment system. We may have missed a few articles if they had not mentioned an e-payment system in the title at the first screening stage. Even we might have missed some articles during the search time, even if it's available on databases other than those mentioned in the methodology section. Future research may be carried out by determining the measurement scale for each variable and performing statistical validation. A thorough investigation using primary data to examine the linkages and gauge each variable's effect on a specific population group may be conducted in the future. Future studies can be conducted to take the proposed theoretical model into account and apply it to the acceptance and adoption of any new technologies.

Conclusion

Factors analysis was applied in this study, based on a systematic examination of the literature, to give a complete picture of the literature and to suggest two factors, motivational factors and inhibition factors. The main contribution of this study is that it has considered all the factors impacting the adoption of an e-payment system. This will help to increase the acceptance rate of an e-payment system. The theoretical model will be useful for researchers, and academicians to understand the effects of the adoption of an e-payment system.

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Type - setting and printing at Sardar Patel University Press, Vallabh Vidyanagar - 388 120
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