

# The Sustainability of Financial Innovation in E-payment Systems

Deepa Jain

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# Table of Contents

|  |             |
|--|-------------|
| List of Figures  | <i>vii</i>  |
| List of Tables   | <i>ix</i>   |
| List of Abbreviations  | <i>xiii</i> |
| About the Authors  | <i>xvii</i> |
| Acknowledgement  | <i>xix</i>  |
| <b>Chapter 1 Financial Market and Overview</b>   | <b>1</b>    |
| <b>Chapter 2 Financial Market Research Insights – Past, Present and Future</b>                   | <b>23</b>   |
| <b>Chapter 3 Framework and Design in Financial Market Research</b>                               | <b>57</b>   |
| <b>Chapter 4 Customer Perception Towards Financial Innovation</b>                                | <b>73</b>   |
| <b>Chapter 5 Identification and Validation of Sustainability Factors in Financial Innovation</b> | <b>115</b>  |
| <b>Chapter 6 Sustainability of Financial Innovation</b>  | <b>155</b>  |
| <b>Chapter 7 Strategy Development and Innovation in Financial Market</b>                         | <b>185</b>  |
| References   | <i>193</i>  |
| Index  | <i>211</i>  |

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# List of Figures

## Chapter 1

|           |  |    |
|-----------|--|----|
| Figure 1. | Underlying Area of Proposed Research.  | 4  |
| Figure 2. | Pillars of Sustainability.   | 8  |
| Figure 3. | Research Process.  | 13 |
| Figure 4. | Research Design of Structural Equation Modelling (SEM) Through the Flow Diagram. | 15 |
| Figure 5. | Research Design of Literature Review Process Through Flow Diagram.               | 16 |

## Chapter 2

|           |   |    |
|-----------|---|----|
| Figure 1. | Co-Authorship Map.                            | 27 |
| Figure 2. | Countries Map.                                | 28 |
| Figure 3. | Keywords Map.                                 | 30 |
| Figure 4. | Source Map.                                   | 32 |
| Figure 5. | Growth of 108 Articles (India).               | 34 |
| Figure 6. | Growth of 701 Articles (Abroad).              | 35 |
| Figure 7. | Keywords Citation Map Using Cluster Analysis. | 52 |
| Figure 8. | Conceptual Model for Financial Market.        | 54 |

## Chapter 4

|           |   |    |
|-----------|---|----|
| Figure 1. | Beyond Shopping E-Payment is Generally Used For.      | 78 |
| Figure 2. | Preference for Payment Mode.                          | 79 |
| Figure 3. | Reasons for Use of E-Payment.                         | 83 |
| Figure 4. | Preference for E-Payment Over Other Modes of Payment. | 84 |
| Figure 5. | Barriers in Acceptance of E-Payment.                  | 86 |

|            |  |    |
|------------|--|----|
| Figure 6.  | Communication Benefits Offered by E-Payment.                   | 86 |
| Figure 7.  | Most Innovative Features of Financial Technology of E-Payment. | 87 |
| Figure 8.  | Innovative Features of Financial Service of E-Payment.         | 88 |
| Figure 9.  | Features that Make E-Payment as Financial Innovation.          | 88 |
| Figure 10. | Quality of E-Payment.  | 90 |
| Figure 11. | Reasons Which Resist Use of E-Payment.                         | 91 |

### Chapter 5

|           |   |     |
|-----------|---|-----|
| Figure 1. | Flow Diagram of Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA).                                     | 121 |
| Figure 2. | Validation of Factor 1 (PIE) Through CFA.   | 133 |
| Figure 3. | Validation of Factor 2 (AUTT) Through CFA.  | 135 |
| Figure 4. | Validation of Factor 3 (FSI) Through CFA.   | 137 |
| Figure 5. | Validation of Factor 4 (TC) Through CFA.  | 139 |
| Figure 6. | Validation of Factor 5 (TCP) Through CFA.   | 141 |
| Figure 7. | Validation of Factor 6 PIS Through CFA.   | 143 |
| Figure 8. | Validation of Identified Factors Through CFA.   | 145 |
| Figure 9. | Research Model for Determinants of E-Payment System ( <i>Designed by the Researchers on the Basis of Extracted Factors</i> ). | 153 |

### Chapter 6

|           |   |     |
|-----------|---|-----|
| Figure 1. | Hypothetical Structural Model for SEPS.                       | 161 |
| Figure 2. | Steps in Developing and Analyzing SEM.                        | 163 |
| Figure 3. | Flow Diagram of Structural Equation Modelling (SEM) Analysis. | 165 |
| Figure 4. | Structural Model of SEPS.                                     | 166 |
| Figure 5. | Result of Hypothesis Testing.                                 | 169 |
| Figure 6. | Sustainable E-payment System Based on Target Segments.        | 183 |

### Chapter 7

|           |  |     |
|-----------|--|-----|
| Figure 1. | Research Model for E-Payment System ( <i>Designed by the Researchers Based on Extracted Factors</i> ). | 187 |
|-----------|--|-----|

# List of Tables

## Chapter 1

|          |   |    |
|----------|---|----|
| Table 1. | Overview of Sustainable Development Goals.              | 9  |
| Table 2. | Summary of Research Objectives, Gaps, and Contribution. | 18 |

## Chapter 2

|          |   |    |
|----------|---|----|
| Table 1. | Outline of Bibliometric Analysis (BA).                              | 26 |
| Table 2. | Top Countries Based on Citation.                                    | 29 |
| Table 3. | Top Keywords Based on Citation.                                     | 31 |
| Table 4. | Top Sources Based on Citation.                                      | 33 |
| Table 5. | Summary of Studies on E-payment System in Indian Scenario.          | 37 |
| Table 6. | Summary of Studies on E-payment System in International Scenario.   | 45 |
| Table 7. | Citation of Factors/Variables (In the Context of E-payment System). | 46 |
| Table 8. | Identified Clusters With Dominant Keywords.                         | 53 |

## Chapter 3

|          |                               |    |
|----------|-------------------------------|----|
| Table 1. | Outline-Research Methodology. | 59 |
| Table 2. | Framework Empirical Analysis. | 62 |

## Chapter 4

|          |   |    |
|----------|---|----|
| Table 1. | Outline of Chapter 4.                   | 75 |
| Table 2. | Demographic Profile of the Respondents. | 76 |
| Table 3. | Feedback of Respondents on E-Payment.   | 81 |
| Table 4. | Barriers Faced While Using E-Payment.   | 85 |
| Table 5. | Usage of E-Payment Based on Gender.     | 93 |

|           |   |     |
|-----------|---|-----|
| Table 6.  | Usage of E-Payment Based on Age.              | 95  |
| Table 7.  | Usage of E-Payment Based on Education.        | 98  |
| Table 8.  | Usage of E-Payment Based on Income.           | 100 |
| Table 9.  | Perception of Users Towards E-Payment System. | 103 |
| Table 10. | Continuum of the Direction of Responses.      | 110 |

## **Chapter 5**

|           |   |     |
|-----------|---|-----|
| Table 1.  | Outline of Chapter 5.   | 117 |
| Table 2.  | Types of Validity.  | 119 |
| Table 3.  | Cronbach's Reliability Statistics of All Statements.                                    | 123 |
| Table 4.  | KMO and Bartlett's Test (Sample Adequacy Test).   | 126 |
| Table 5.  | Total Variance Explained.   | 127 |
| Table 6.  | Rotated Component Matrix of All Statements.   | 130 |
| Table 7.  | Factor 1 – 'Payment Infrastructure Ecosystem' (PIE).                                    | 131 |
| Table 8.  | Regression Coefficient Calculated Through Validation of Factor 1 (PIE) Through CFA.     | 133 |
| Table 9.  | Factor 2 – 'Autonomy to Use Technology' (AUTT).   | 134 |
| Table 10. | Regression Coefficient Calculated Through Validation of Factor 2 (AUTT) Through CFA.    | 135 |
| Table 11. | Factor 3 – 'Financial Sustainable Innovation' (FSI).                                    | 136 |
| Table 12. | Regression Coefficient Calculated Through Validation of Factor 3 (FSI) Through CFA.     | 138 |
| Table 13. | Factor 4 – 'Technology Characteristics' (TC).   | 139 |
| Table 14. | Regression Coefficient Calculated Through Validation of Factor 4 (TC) Through CFA.      | 140 |
| Table 15. | Factor 5 – 'Technology Communication Platform' (TCP).                                   | 141 |
| Table 16. | Regression Coefficient Calculated Through Validation of Factor 5 TCP Through CFA.       | 142 |
| Table 17. | Factor 6 – 'Payment Information Security' (PIS).  | 142 |
| Table 18. | Regression Coefficient Calculated Through Validation of Factor 6 (PIS) Through CFA.     | 144 |
| Table 19. | Regression Coefficient Calculated Through Validation of Identified Factors Through CFA. | 146 |
| Table 20. | Result of Measurement Model (E-Payment System).   | 147 |

|                  |   |     |
|------------------|---|-----|
| Table 21.        | Discriminant Validity of E-Payment System Scale (AVE & Squared Interconstruct Correlations – SIC Comparison). | 148 |
| Table 22.        | Scale Description for Validated Constructs ( $C_i$ = Factors/Criteria, $C_{ij}$ = Sub-Factor/Sub-Criteria).   | 149 |
| <b>Chapter 6</b> |   |     |
| Table 1.         | Citation Reporting of Adoption Intention.   | 158 |
| Table 2.         | Citation Reporting of Trust.  | 159 |
| Table 3.         | Citation Reporting of Sustainability.   | 160 |
| Table 4.         | Citation Reporting of SEM Application Globally.   | 164 |
| Table 5.         | Path Estimates for SEPS Model.  | 167 |
| Table 6.         | Goodness-of-Fit of Structural Model of SEPS.  | 167 |
| Table 7.         | Moderating Effect of Gender.  | 171 |
| Table 8.         | Moderating Effect of Age.   | 172 |
| Table 9.         | Moderating Effect of Education Level.   | 173 |
| Table 10.        | Moderating Effect of Family Type.   | 174 |
| Table 11.        | Moderating Effect of Marital Status.  | 175 |
| Table 12.        | Moderating Effect of Family Income.   | 176 |
| Table 13.        | Segmentation Approach to Sustainability of E-Payment System on Customer Perspective (SEPSCP).                 | 182 |
| <b>Chapter 7</b> |   |     |
| Table 1.         | Summary of Contributions of the Study.  | 188 |
| Table 2.         | Summary of Proposed Strategies.   | 190 |

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# List of Abbreviations

|           |  |
|-----------|--|
| AGFI      | Adjusted Goodness of Fit Index                       |
| AHP       | Analytical Hierarchy Process                         |
| AI        | Adoption Intention                                   |
| AMOS      | Analysis of a Moment Structures                      |
| ANOVA     | Analysis of Variance                                 |
| ATT       | Attitude   |
| AUTT      | Autonomy to Use Technology                           |
| AVE       | Average Variance Extracted                           |
| BHIM      | Bharat Interface for Money                           |
| BI        | Behavioural Intention                                |
| BA        | Bibliometric Analysis                                |
| CFA       | Confirmatory Factor Analysis                         |
| CFI       | Comparative Fit Index                                |
| CMIN      | Chi-Square Value                                     |
| CMIN/df   | Chi-Square Value Normalized by Degrees of Freedom    |
| COD       | Cash on Delivery                                     |
| COMP      | Compatibility  |
| CR        | Composite Reliability                                |
| <i>df</i> | Degree of Freedom                                    |
| Dipam     | Department of Investment and Public Asset Management |
| DPs       | Digital Payments                                     |
| DPS       | Digital Payment System                               |
| DPSs      | Digital Payment Systems                              |
| DWs       | Digital Wallets                                      |
| EC        | Expected Cross-Validation Index                      |
| ECS       | Electronic Clearing Service                          |

|         |  |
|---------|--|
| EFA     | Exploratory Factor Analysis                        |
| EOU     | Ease of Use  |
| EP      | E-Payment/Electronic Payment                       |
| EPCFA   | Exploratory Principal Component Factor Analysis    |
| EPs     | E-Payments/Electronic Payments                     |
| EPS     | E-Payment System/Electronic Payment System         |
| EPSs    | E-Payment Systems/Electronic Payment Systems       |
| e-WOM   | Electronic Word-of-Mouth                           |
| FC      | Facilitating Conditions                            |
| FSI     | Financial System Innovation                        |
| GFI     | Goodness of Fit Index                              |
| GOF     | Goodness-of-Fit                                    |
| G2P     | Government-to-Person                               |
| IFI     | Incremental Fit Index                              |
| IMPS    | Immediate Payment Service                          |
| ITA     | Intention to Adopt                                 |
| ITU     | Intention to Use                                   |
| JoMoPay | Jordan MP/Jorden Mobile Payment                    |
| KMO     | Kaiser–Meyer–Olkin                                 |
| KMO-MSA | Kaiser–Meyer–Olkin Measure of Sampling Adequacy    |
| LR      | Literature Review                                  |
| Meity   | Ministry of Electronics and Information Technology |
| MP      | Mobile Payment                                     |
| MPOS    | Mobile Point-of-Sale                               |
| MPS     | Mobile Payment System                              |
| MPs     | Mobile Payments                                    |
| MSA     | Measure of Sampling Adequacy                       |
| MSV     | Maximum Shared Variance                            |
| NEFT    | National Electronic Fund Transfer                  |
| NCR     | National Capital Region                            |
| NFI     | Normed Fit Index                                   |
| NT      | New Technology                                     |

|        |  |
|--------|--|
| PCA    | Principal Component Analysis                                       |
| PCLOSE | Process Close  |
| PE     | Performance Expectancy   |
| PEOU   | Perceived Ease of Use  |
| PGFI   | Parsimony Goodness of Fit Index                                    |
| PIE    | Payment Infrastructure Ecosystem                                   |
| PIS    | Payment Information Security                                       |
| PLS    | Partial Least Square   |
| PNFI   | Parsimony Normed Fit Index   |
| PR     | Perceived Risk   |
| PS     | Perceived Security   |
| PU     | Perceived Usefulness   |
| QR     | Quick Response   |
| RA     | Relative Advantage   |
| RFI    | Relative Fit Index   |
| RMR    | Root Mean Square Residual  |
| RMSEA  | Root Mean Square Error of Approximation                            |
| RNI    | Relative Non-Centrality Index                                      |
| SDGs   | Sustainable Development Goals                                      |
| SE     | Structural Equation  |
| SEM    | Structural Equation Modelling                                      |
| SEPS   | Sustainability of The E-payment System                             |
| SEPSCP | Sustainability of The E-payment System from a Customer Perspective |
| SI     | Social Influence   |
| SLR    | Systematic Literature Review                                       |
| SM     | Structural Model   |
| SMEs   | Small and Medium Enterprises                                       |
| SPSS   | Statistical Package of Social Science                              |
| SRMR   | Standardized Root Mean Square Residual                             |
| SRW    | Standardized Regression Weights                                    |
| SUS    | Sustainability   |
| TACT   | Technology Affordances and Constraints Theory                      |

*xvi List of Abbreviations*

|       |  |
|-------|--|
| TAM   | Technology Acceptance Model                        |
| TC    | Technology Characteristics                         |
| TCP   | Technology Communication Platform                  |
| TRIAL | Trialability                                       |
| TRT   | Trust  |
| UAE   | United Arab of Emirates                            |
| UB    | Usage Behaviour                                    |
| UNs   | United Nations                                     |
| UTAUT | Unified Theory of Acceptance and Use of Technology |
| VE    | Variance Extracted                                 |
| VIF   | Variance Inflation Factor                          |

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## Chapter 1

# Financial Market and Overview

### Abstract

This chapter introduces the concept of financial market and highlights the role of e-payment systems in the financial market by focusing on the keywords of financial innovation, e-payment and sustainability.

### 1.1 Introduction

A robust foundation of a well-structured financial system in a country leads to economic development. The financial system of a country is responsible for smooth supply of required financial inputs in the economy for constant supply of goods and services in the economy to support the welfare and living standard of the population. Financial system plays an important role in filling the gap between the demand and supply of money and monetary assets to enable smooth flow of funds through the mechanism of saving and investment (Gordon & Natrajan, 2019). A strong correlation exists between financial system and economic development of a country (King & Levine, 1993).

The financial system covers under its umbrella the key contribution of financial markets and financial intermediaries to support the system (Gordon & Natrajan, 2019). Financial market is an important mode to transfer funds between the provider and user. A well-established financial system aims to identify and agglomerate sources of small funds and at the same time channelize these funds by recognizing most productive users, and further ensure the usage of these funds in terms of investment in high-return markets to achieve growth (Greenwood & Smith, 1997; Stiglitz, 1998). Merton (1993, 1995) gave six functions performed by financial systems: (1) Enable transactions through payment system; (2) provide information to aid in decision-making; (3) regulate risk; (4) pool funds from various sources; (5) handle problems of asymmetric information and moral hazard and (6) rotate funds across time and space. Various financial intermediaries along with financial markets exhibit an important role to attain the goals of the financial system. The financial market directs in efficient allocation of risk and funds. The secondary market gives more liquidity and risk diversification as against primary markets where new issues in terms of financial claims are made (Stiglitz, 1998). Capital market allows to deal in long-term securities with a

## 2 *The Sustainability of Financial Innovation in E-Payment Systems*

maturity period above one year against money market that allows to deal in financial assets with a maturity period below and equal to one year to meet short-term needs of funds (Gordon & Natrajan, 2019). An important role in financial system is played by banks and regulatory bodies as they diversify and reduce the risk shocks and ensure stability. Each financial market under its regulatory framework acts uniquely and contributes differently in the growth of financial system (Knight, 1998; Thakor, 1996).

The core of financial system in terms of financial markets, financial intermediaries, financial regulators and financial instruments lies in the trading of financial assets or movement of funds or money or monetary assets and performing transactions which ultimately depends on payment. With globalization and liberalization, the financial market was not limited to national boundaries but expanded globally. The financial markets are globally linked through the vast network of telecommunication to allow 24\*7, uninterrupted transfer of payments (Merton & Bodie, 1995). Today, the global investors make payment using digital currencies through the modes of UPI, blockchain, cryptocurrencies and many more. Jain et al. (2021) identified strong association between financial system and financial market with an impact of financial technology that leads to digital payment system requiring strong governance. With advancements of technologies like e-payment system, the transfer of fund becomes fast and secure. The financial market leads to economic growth which in turn promotes financial market and the cycle goes on (Greenwood & Smith, 1997). Today, efficient financial system is the need of the hour for the growth of economy (Stiglitz, 1998). The e-payment system being the vital mode of payment requires a comprehensive study to make the global financial system efficient in long term. The current study focuses on the financial innovation in e-payment system and its role in the sustainability of endogenous financial market. In the current study, researchers have examined the financial market with a major focus on the e-payment system. The study focuses on the three dimensions of the financial system: (1) e-payment system, (2) financial innovation and (3) sustainability (Jain et al., 2021).

According to 'World Population Prospects: The 2015 revision' Population Database of United Nations Population Division (UNPD), 'India has largest proportions of the population in age group of 10-to-24, with 242 million-in spite of having a lesser population than China, which has 185 million young people' (World-Population-Prospects, 2015). As per India's Census 2011, 'youth (15-24 years) constitutes one-fifth (19.1%) of India's total population'. India has the largest population after China and is expected to contribute by 2020, a 34.33% share of youth out of the entire population in India (Census-of-India, 2011).

India is a market where the payment was made in cash dominated by the informal sector and shadow economy (Sharma, 2019). India is growing day by day; people's GDP is increasing – most companies are expanding daily, and the proportion of people using digital modes is also expanding (McKinsey Global Institute, 2019). Electronic payment (e-payment) is becoming popular due to youth, international mobility and government intervention. As a result, the penetration of the new payment system started. India is a part of the global

market and globally, e-payment is an accepted mode of payment, but there is a problem with black money in India (Goel, 2018; Kumar, 2017; Sharma, 2019). This black money created a hindrance in the 'acceptance of e-payment' on a broader scale. Even after continuous efforts taken by the government, there is still some lacuna in the 'acceptance of the e-payment system (EPS)' by the customers. As internationally, cash is not a valid payment option; there are many innovations noticed in the sector of finance, and e-payment is one of them. E-payment is an essential mode of payment in developed countries globally and equally important in developing countries like India. *There is significantly less work carried out in the EPS. This is the real issue for the Government of India. However, there is some lacuna in the 'acceptance of e-payment' in India. Therefore, the current research topic is based on the customer perspective regarding identifying and validating sustainability factors in financial innovation with a notable attention on the EPS in the Indian market* (Jain et al., 2021).

India has witnessed three phases: Pre-IT phase, Post-IT phase and demonetization phase. *Pre-IT phase* is the duration when people don't know about the internet. The penetration level of mobile, internet and computer was deficient. At that time, people also used to purchase goods and services, and a large portion of it comprises of offline market. *Post-IT phase* was seen when Rajiv Gandhi, former Prime Minister, brought a complete change in the Indian communication system by bringing IT revolution in India in the year 1984. Before this era, neither the Indian government nor the Indian people were aware of the concept of IT. As a result of the IT revolution, the internet started growing day by day. India is a young country people were switching. *Post-demonetization phase* was seen from midnight of 8 November 2016, and ₹500 and ₹1,000 were no more a legal tender due to the demonetization drive initiated by our Hon'ble Prime Minister Narendra Modi. The purpose behind the demonetization drive was to 'combat corruption, black money, money laundering, financing of terrorists, and counterfeit notes' (Jain et al., 2020). Although demonetization is not new for the Indians, but this time, it was unique due to the presence of new modes of online payments supported by various banking sectors.

Finance Minister Arun Jaitley quoted that *the government's step to drawback ₹500 and ₹1000 currency will shift the country towards a digital economy* (Prakash, 2016). The demonetization resulted in spurge in digital transactions, moving India towards a cashless economy. Neeraj Kumar, Secretary, 'Department of Investment and Public Asset Management (Dipam)', said, *The government is committed to digital transactions infrastructure and putting in place the ecosystem where facility for transactions can be availed at doorsteps by the common man* (Tiwari, 2016). The government has taken various initiatives like the Digital India Project, Jan Dhan Account, Demonetization, GST, Benami Property to keep the audit trails of every transaction to reduce corruption, financing terrorist, fight black money, counterfeit currency and money laundering. The demonetization move aimed to make India a cashless economy. The action resulted in exponential growth for digital payment services for consumers (RBI, 2019). But the researchers questioned – Was the country prepared for such a transition towards a digitalized economy? India is a cash-intensive economy, where majority of

#### 4 The Sustainability of Financial Innovation in E-Payment Systems

transactions are done on cash basis. The question needs to be analyzed based on the economy's structure dominated by the informal sector, poor people of rural India and under-banked and unbanked populations, where the uneducated and senior citizens are not prepared to adopt new technology. The government opened a plethora of opportunities for digital payments, but the challenges for the Indian economy are more complex. *To solve this research issue, we should think of the sustainability of financial innovation of electronic payment systems in the Indian market* (Jain et al., 2021).

There have been drastic changes in the payment patterns of online customers; and the set of behaviour and preferences of the customer impact their decision towards the adoption intention of the EPS, which is a significant area for financial institutions, government, decision-makers, policy-makers and researchers for designing the strategies to make the EPS sustainable.

E-payment system has become an important area with the rapid growth in technology. The pandemic of COVID-19 has made EPS a necessity, to be safe and sound by being online instead of going for offline payments. Every business has tried its best to make EPS successful by being flexible as per the changes in the external environment. Identifying factors and sub-factors regarding the sustainability of EPS based on the customer will help serve the market efficiently. However, predicting the mysterious minds of the customer is very challenging and complex for the researchers. Before that, the conceptual as well as theoretical knowledge in this area is crucial. Fig. 1 shows the underlying areas of the present study.

The uniqueness of the present work is to understand the e-payment behaviour and preferences of customers and identify the strategies to make this EPS sustainable. For this purpose, customer preferences are explored, and EPS dimensions are determined and validated to determine the factors important in guiding

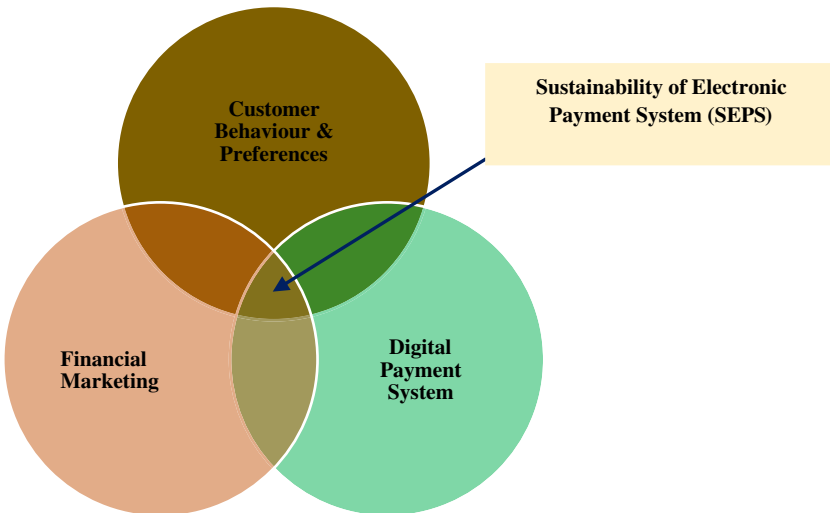


Fig. 1. Underlying Area of Proposed Research.

the formulation of the financial marketing strategy using adoption intention, trust and sustainability. *The relationship between financial marketing, customer behaviour, preferences and digital payment systems is a major concern for the present study.* Based on the interlink between the trio as depicted in Fig. 1, the researchers developed a structural model to attain the sustainability of the e-payment system (SEPS).

A paramount concern of interest for both practitioners and academics is to determine whether EPS is sustainable. If yes, then what are the factors contributing to the SEPS, and if not sustainable, how to make EPS sustainable? Thus, the present study left no stone unturned in identifying and validating the factors in the sustainability of the financial innovation of the *electronic payment system in the Indian market.*

## 1.2 Theoretical Perspective

According to McKinsey Report (2019), India is the biggest market for digital consumer base with exponential growth and an estimated prospective market with 350 million smartphone users by 2023 (McKinsey Global Institute, 2019). It will pose severe challenges for the marketers to understand their behaviour towards the digital move. This move induced the researchers to initiate a study to know the psychological implications behind the digital movement. Although the government opened a platform for digitalized India, the curiosity provoked the Authors *to identify and validate sustainability factors towards financial innovation – with special reference to the EPS in the Indian market.* The following sub-section will elaborate on the theoretical perspective of the keywords of e-payment, financial innovation and sustainability used in the present study.

### 1.2.1 E-Payment

The term e-payment has been synonymously used with *electronic payment or digital payment or cashless payment, or digital transaction.* According to Government-of-India (2016), *digital transactions* are defined as ‘transactions in which the customer empowers the movement of funds from electronic modes, and the money moves directly between accounts in banks or with entities/providers through the means of cards (debit/credit), mobile-wallets, mobile-apps, net-banking, Electronic-Clearing-Service (ECS), National-Electronic Fund Transfer (NEFT), Immediate-Payment-Service (IMPS), prepaid-instruments, or other similar means’.

The ‘Payment and Settlement Act 2007’ has also defined digital payments, that says ‘*electronic funds transfer means any movement of money initiated by a user through order, direction or authorization to a bank to debit or credit an account held with that bank through electronic means and includes point-of-sale-transfers; automated-teller-machine (ATM) transactions, direct deposits or withdrawal-of-funds, transfers initiated by telephone, internet and card payment*’ (Watal, 2017).

## 6 The Sustainability of Financial Innovation in E-Payment Systems

*Vision 2018 of Payment and Settlement Systems (PSS)*, in India focused on ‘Building best class of PSS for a cash-less-India through responsive regulation, robust infrastructure, effective supervision, and customer-centricity’; however, the vision of 2018 stressed on 5Cs ranging from ‘Coverage, Confidence, Cost, Convenience and Convergence’ (RBI, 2018). Vision-2018 was framed to achieve an upsurge in the usage of Aadhar, growth in EPS, mobile banking users, development in infrastructure and fall in the use of paper-based payments (RBI, 2018).

*Vision 2019–2021 of Payment and Settlement Systems (PSS) in India* focuses on ‘To authorize every Indian with access to variety of e-payment options that is safe, secure, convenient, quick and affordable,’; thus, ‘empowering exceptional payment experience for the customer through an enabled ecosystem’ (RBI, 2019).

*Vision 2021* aims to (1) ‘enhance the experience of users’; (2) ‘empower system operators and service providers of payment’; (3) ‘enable the ecosystem and infrastructure’; (4) ‘put in place a forward-looking regulation’ and (5) ‘be supported by a risk-focused supervision’. To achieve *Vision 2021*, stress was put on 4Cs ranging from ‘Competition, Confidence, Cost, and Convenience’ (RBI, 2019).

With a vision to transform India from a cash dominated economy to a digital economy, the *Government of India* initiated a flagship programme on *Digital India*, and one of the chief aspects of *Digital India* is ‘Faceless, Paperless, Cashless’; to provide digital payments facilities to all the citizens of India in a secured, convenient, affordable, easy and quick manner (MeitY, 2021). The task of ‘Promotion of Digital Transactions including Digital Payments’ has been assigned to the *Ministry of Electronics & Information Technology* (MeitY), and it has taken various initiatives to create awareness and on an extensive level applied strategies to create an effective ecosystem to enable and promote the usage of digital payments by the citizens in India. Government issued various guidelines for promoting payments through digital means to promote digital government collections, enhance acceptance of digital infrastructure, enable institutions, corporates and merchants to accept digital payments and allow every citizen to use digital payment systems (Government-of-India, 2016).

The various stakeholders involved in the e-payment gateway consist of payment instruments used, purpose of payment, mode of operation and consumers involved. The different payment instruments range from debit cards, credit cards, prepaid cards, point of sale. The purpose of payment may vary from e-trading, e-banking, mobile banking, e-shopping, e-ticketing, e-tax filing, e-money transfer and e-payment. The mode used to make e-payment can be mobile, internet, SMS, Wi-Fi or any other application. The consumers of this e-payment service can be the government, merchants, customers and businesses. The growth of the digital payment industry depends on the successful contribution of each of the elements of this interlinked web of the payment ecosystem.

### 1.2.2 Financial Innovation

‘Innovate’ is defined in Webster’s (1988) Collegiate Dictionary as ‘to introduce as or as if new’, with derivation from the Latin word ‘Novus’ or new. *Financial innovation* is seen as innovating new ways of reducing risk and increasing return concerning product, process or institution. Tufano (2003) defined ‘Financial innovation as the act of creating and then popularizing new financial instruments as well as new financial technologies, institutions, and markets’. *Financial Innovation* covers the range of *products, institutions, and processes*.

Innovations may be categorized as product innovation covering ‘new derivative contracts, new corporate securities, or new form of pooled investment products and process innovation covering new means of distributing securities, processing transactions, or pricing transactions’. However, this demarcation line between product innovation and process innovation is unclear in practice, as the two are majorly interlinked (Tufano, 2003).

Tufano (2003) provided the catalyst to stimulate innovation, namely, (1) ‘inherently incomplete markets’; (2) ‘inherent agency concerns and information asymmetries’; (3) ‘transaction, search, or marketing costs’; (4) ‘taxes and regulation stimulate innovation’; (5) ‘increasing globalization and perceptions of risk’ and (6) ‘technological shocks’.

There may be new products resulting from a combination of one or more of the above-discussed stimuli. If a product (e.g., Index Funds) comes into existence due to all the above combinations, then discussing the most critical stimuli becomes absurd (Tufano, 2003). *Innovation* is the result of various steps taken for ‘inventing new products and the processes employed for diffusion or adoption of the newly developed products’ (Tufano, 2003). Tufano (2003) highlighted that ‘empirical studies of adoption of financial innovations have focused on introducing automated teller machines, small business credit scoring, off-balance sheet activities of banks, junk-bond issuance, and corporate security innovations; to know the organizations adopting innovation and the pace of adoption’. However, there are a plethora of financial innovations to be studied. The above discussion highlights the gap to be filled by future studies or our present study.

A strong relationship exists between ‘finance and technological innovation’ (Beck et al., 2016). *Financial innovation* is not limited to finding ‘new financial instruments or innovations by financial institutions’. Still, it is a broader concept covering various financial upgradation and improvements providing benefits to a larger section of society (Laeven et al., 2015). In simple terms, financial innovation may be understood as the interlinked web of complex relationships between ‘technology’, ‘changes in perceived market conditions’, ‘changes in the regulatory environment’ and ‘high, variable, and unpredictable inflation, interest rates, and financial markets’.

### 1.2.3 Sustainability

In a world with a dynamic environment where the pace of innovation is higher, sustainability becomes a matter of concern. Technology development requires a

plethora of money, effort, time, risk and many more. So whether the new technology meets the global needs of sustainability is an alarming topic, for which there is a need to find the answer to the sustainability of the latest technology. As sustainability has become ubiquitous these days, there is a need to explore sustainability. As per the researchers' understanding, sustainability may be read as: *The innovative capability of the new technology to meet the challenges of the future with a right mix of fulfilling the present needs of the users of the technology, efficiently and effectively while creating useful outcomes for the environment, social development and economic development.* The researchers may precisely define sustainability as finding answers to the following with regard to new technology (NT): Whether it is (NT) long term?; Whether it is (NT) accessible?; Whether it is (NT) related to a consumer perspective?; Whether it is (NT) secure?; Whether it is (NT) simple to use?; Whether it is (NT) smart in terms of technology acceptance? If the answers to the above questions are favourable, it indicates the sustainability of the new technology.

*United Nations World Commission on Environment and Development* (1987), also known as the *Brundtland report* defined sustainability as: 'Fulfilling the current needs without compromising the ability of future generations to meet their own needs'. A recent discussion, conclusions at *World Summit* (UN-General-Assembly, 2005), identified three critical pillars of sustainability as depicted in Fig. 2:

- *Environmental sustainability* aiming 'to maintain a sound foundation of resources, preserve ecosystems and biodiversity, avoid over-exploitation of renewable resources and safeguard the quality of the atmosphere, recycle, etc'.
- *Economic sustainability* with an effort for 'generating wealth in the long term, through producing goods and services, creating jobs and prosperity, pursuing efficiency, etc'.
- *Social sustainability* is concerned with 'achieving equity, providing social services, guaranteeing social inclusion, preserving cultures, groups, places, and ensuring political accountability and participation (community)'.

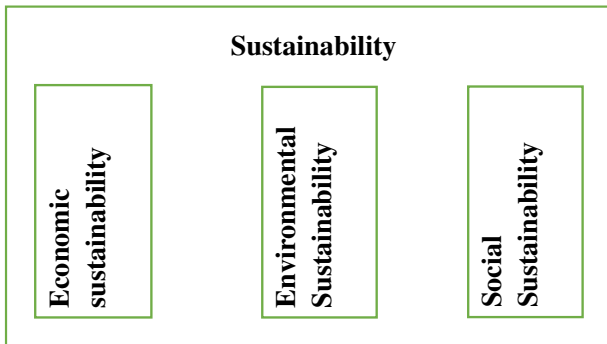


Fig. 2. Pillars of Sustainability.