Essays on the Adoption & Continuance of Agri-Marketing Mobile Applications In an Emerging Market Context

Doctoral Thesis

by

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JANUARY 2024

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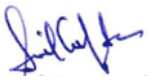
Declaration of Originality

I hereby declare that the work which is being presented in the thesis entitled "Essays on Adoption & Continuance of Agri-Marketing Mobile Applications In an Emerging Market Context" has been solely authored by me. It presents the result of my own independent investigation/research conducted during the time period from July 2018 to August 2023 under the supervision of Dr. Dipanjan Kumar Dey, Assistant Professor, Department of Marketing, IIM Ranchi. To the best of my knowledge, it is an original work, both in terms of research content and narrative, and has not been submitted or accepted elsewhere, in part or in full, for the award of any degree, diploma, fellowship, associateship, or similar title of any university or institution. Further, due credit has been attributed to the relevant state-of-the-art and collaborations (if any) with appropriate citations and acknowledgments, in line with established ethical norms and practices. I also declare that any idea/data/fact/source stated in my thesis has not been fabricated/ falsified/ misrepresented. All the principles of academic honesty and integrity have been followed. I fully understand that if the thesis is found to be unoriginal, fabricated, or plagiarized, the Institute reserves the right to withdraw the thesis from its archive and revoke the associated Degree conferred. Additionally, the Institute also reserves the right to appraise all concerned sections of society of the matter for their information and necessary action (if any). If accepted, I hereby consent for my thesis to be available online in the Institute's Open Access repository, inter-library loan, and the title & abstract to be made available to outside organizations.

Signature 

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Acknowledgments

I would like to express my sincere gratitude to all the individuals and organizations that have extended their support and guidance throughout the research work and preparation of this thesis. In particular, I am grateful to my advisor Dr. Dipanjan Kumar Dey, who extended all his support and advice while granting me the freedom to explore different ways to combine academic rigor and practical relevance in this interdisciplinary research. In addition, I am grateful to the members of the Doctoral Committee, Reviewers, and Editors of the journals to which I submitted my work, and attendees of the conferences I presented in, whose discussions and comments helped me to improve my research work. I am also grateful to all the participants in this study for their time and willingness to share their experiences.

Certificate

This is to certify that the thesis entitled "**Essays on Adoption & Continuance of Agri-Marketing Mobile Applications In an Emerging Market Context**" submitted by **Sunil Gupta (Entry Number: 2018HSZ0002)** for the award of the degree of **Doctor of Philosophy** of Indian Institute of Technology Ropar, is a record of bonafide research work carried out under my guidance and supervision. To the best of my knowledge and belief, the work presented in this thesis is original and has not been submitted, either in part or full, for the award of any other degree, diploma, fellowship, associateship or similar title of any university or institution.

In my opinion, the thesis has reached the standard fulfilling the requirements of the regulations relating to the Degree.

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Lay Summary

Mobile phones having internet facilities are influencing our choices and use of products. Mobile-based software having particular functional use is referred to as mobile applications. These mobile applications have changed the way people do their day-to-day activities in sectors like banking, e-commerce and finance. However, their impact is less in the field of agri-marketing in rural sector. The lack of acceptance and continued use of mobile applications for agri-marketing has restricted its beneficial impact in rural areas. Researchers have suggested that the reason for this reduced usage and influence is lack of knowledge of the needs, preferences and decision-making process of the rural community. Rural community has unique lifestyle and social structure which requires dedicated research for them, which is now taken up in this study. The current research work consists of three essays and uses quantitative methods to investigate the psychological process of initial use and continued use of agri-marketing mobile applications by rural users. The study also explores the role of mobile applications in the psychological empowerment of users. Essay 1 applies the theory referred to as the 'unified theory of acceptance and use of technology' to propose a new set of factors considering the modern development of technology including artificial intelligence. An integrated model giving factors influencing the initial use of agri-marketing mobile applications in the rural sector is presented. The role of brand credibility is also studied. Essay 2 applies the empowerment theory and presents a framework for the psychological empowerment of the users of the mobile app. The framework also presents the conditions required for a mobile app to have the psychological empowerment effect. Further, the outcome of experiencing psychological empowerment is also presented. Besides, role of digital literacy is also studied. Essay 3 consists of two studies. Study 1 applies cognitive appraisal theory and presents a new set of dimensions that lead to the utilitarian evaluation of a product or service, a mobile application in this case. Further, the relationship of these dimensions is established with the emotional reaction of satisfaction and intention of continued usage of the mobile app. Study 2 explores the compatibility of people, tasks, and technology. Accordingly, a set of factors referred to as a 'socio-technical system' is proposed for rational decision-making of continued usage of mobile apps. The outcome of this research work has manifold theoretical and practical implications. The knowledge gained from the results can enable the design, and development of mobile applications that can be taken up for sustained use, leading to the increased autonomy and competence of the rural user.

Abstract

Synergy of internet technology and rapidly expanding mobile applications are significantly impacting a person's consumption and livelihood. However, the adoption, sustained usage, and influence of mobile applications are less in rural agri-marketing, as compared to sectors such as banking, e-commerce and finance. Digital resources have fallen short of their potential to positively influence the socio-economic development of the rural sector due to a lack of insights into the needs, preferences and unique decision-making process of the rural community. The current research work, comprising of three essays, quantitatively investigates the psychological phenomena of adoption and continuance of the agri-marketing mobile applications by rural users along with its role in the psychological empowerment of the users. The data collected from rural participants of the agro-climatic zone of Trans-Gangetic plains is analyzed using structural equation modelling technique. Essay 1 extends the unified theory of acceptance and use of technology with novel set of factors in modern parlance of artificial intelligence enabled digital solutions. An integrated model explaining adoption of agri-marketing mobile applications in rural sector is presented. Also, brand credibility is reported to mediate the relationship between influencing factors and behavioral intention. Essay 2 draws from the empowerment theory and proposes a framework for psychological empowerment of the users of the mobile app by empirically establishing the relationships with its antecedents and consequences. Mediation effect of psychological empowerment on the relationship between its antecedents and consequences is also established. Besides, role of digital literacy is also studied. Essay 3 comprises two studies. Study 1 draws from cognitive appraisal theory and presents a novel set of cognitive appraisal dimensions, positively influencing continuance intention. Further, mediation effect of the discrete emotion of satisfaction, elicited in response to the cognitive appraisal is also reported. Study 2 explores digital congruence of people, tasks and technology. Accordingly, a socio-technical system is proposed for rational decision-making of continuance of usage of mobile apps for agri-marketing. The outcome has manifold theoretical and practical implications as these insights can enable design and development of mobile applications that can be adopted for sustained use, leading to the psychological empowerment of the rural user.

Keywords: Mobile applications, technology adoption, continuance intention, psychological empowerment, cognitive appraisal, socio-technical system, agri-marketing

List of Publications from Thesis

Paper/s in Refereed Journals

Gupta, S. & Dey, D.K. (2023). Risk Perception and Adoption of Digital Innovation in Mobile Stock Trading. ***Journal of Consumer Behaviour (ABDC-A).*** DOI: 10.1002/cb.2225

Papers ready for submission

1. Extending UTAUT2 to agri-marketing mobile applications' adoption in emerging markets: Evidence from India

2. Antecedents and consequences of psychological empowerment by the use of mobile app in agri-marketing

3. Drivers of continuation intention of agri-marketing mobile app: Cognitive appraisal and socio-technical system

Presentations in Conferences (Abroad/International)

1. Gupta, S. & Dey, D.K. (2023), 'Risk perception and adaptation to digital transformation'. ***2023 AMA Winter Academic Conference,*** Nashville (USA), 6-12 February 2023

2. Gupta, S. & Dey, D.K. (2022), 'Digital transformation of retail stock trading' ***ANZMAC 2022,*** Perth ***(***Australia), 5-7 December 2022

3. Gupta, S. & Dey, D.K. (2019), 'Exploring factors for better adoption of digital platform by farmers for user-centered policy framework' ***7th PAN-IIM World Management Conference***, IIM Rohtak, 12-14 December, 2019

Presentations in Conferences (India)

Gupta, S. & Dey, D.K. (2021), 'Mobile applications as a platform for public policy implementation: Is it empowering enough?'. ***3rd Annual India Public Policy Network Conference***, ISB Hyderabad, 26-27 March, 2021

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Notations and Abbreviations

AVE	Average variance explained
β	path estimate
BI	Behavioral Intention
CFA	Confirmatory factor analysis
CFI	comparative fit index
CMB	Common method bias
Cmin/df	Minimum discrepancy (statistical measure)
CR	Composite reliability
FAO-UN	Food and Agriculture Organization of the United Nations
FPO	Farmer-Producer organisation
HTMT	Heterotrait-Monotrait (method)
ICT	Information and communication technology
IS	Information Systems
IT	Information Technology
ITU	International Telecommunication Union
LLCI	Lower level of confidence interval
P	(statistical) probability
PBC	Perceived behavioral control
RMSEA	Root mean square error of approximation
RQ	Research Question
SD	Standard deviation
Se	Standard error
SEM	Structural equation modeling
SRMR	Standardized Root Mean Squared Residual
T	t-statistic (value)
TAM	Technology Acceptance Model
TLI	Tucker Lewis Index
TRA	Theory of Reasoned Action
ULCI	Upper level of confidence interval
UTAUT	Unified theory of acceptance and use of technology
VIF	Variance inflation factor

Chapter 1
Introduction

Digital technology, boosted by artificial intelligence is the most potent resource to cope with the challenges of agriculture, rural livelihood, food system and sustainable development. However, close attention and careful needs assessment of intended users, especially those with limited digital competency is required. For useful application of artificial intelligence-enabled technological resources, user-needs and technological solutions must evolve in cohesion. Digital solutions with user-centric design and compatible technology should be deployed in agriculture and food sector for realising its positive impact, as experienced in other domains such as banking, healthcare and finance. These recommendations published in a report by FAO-UN and ITU in 2021, substantiates the purpose and importance of the current research work comprising comprehensive investigation of the psychological phenomena of adoption and continuance of the digital resources by rural users and its role in their empowerment.

In recent times, mobile phones are considered the highest scale of consumer digital technology (Tamilmani, et al., 2019). Synergy of internet technology and mobile terminals is extensive and significantly impacts a person's life and consumption (Zhong and Chen, 2023) in the form of rapidly expanding mobile based software solutions referred to a mobile applications (Gupta and Dey, 2023). Moreover, agri-marketing is recommended to be an area of importance and worthy of technological intervention for socio-economic development of rural sector (Mittal et al., 2010). Hence agri-marketing mobile applications are chosen as the digital resource for investigation in the current research work.

Digital transformations of individual and organizational activities are becoming increasingly ubiquitous (Park, 2009). This is evident from the rapid adoption of smartphone-based internet that now accounts for 52.2% of global web traffic (Chong et al., 2022). App Annie (2023) reports 255 billion mobile app downloads, a phenomenal increase of 45% over the last three years. Interestingly, mobile applications that now have a widespread penetration worldwide in almost all sectors such as banking, healthcare and finance is struggling to have a wide acceptance and adoption among the target audience of agricultural sector (Manimekalai, 2013). Dey et al. (2016) reports that developers and marketers of mobile based solutions were not sufficiently engaging with farmers. The existing digital services, especially those for smallholder farmers (FAO, 2012),

lack continuance in the agriculture domain as they hardly provide a comprehensive set of services required for a farming cycle (Mushi et al., 2022). Nakasone et al. (2014) opine that efforts to create digital solutions for agriculture would benefit from a more careful groundwork to assess needs and preferences of information services. Moreover, the rural sector, consisting of a major part of the workforce in developing countries, has a unique socio-demographic structure (Park, 2009) that demands concerted research work. Agri-marketing mobile applications are gaining traction among the farmers across the world. However, their efficacy in providing the promised digital solutions to farmers remain grossly unanswered (FAO, 2013). This is especially true for emerging markets that are known to have complex social, cultural and technological environments.

Agriculture is increasingly becoming knowledge-intensive. Still, a vast number of farmers, especially those with smaller land holdings, are globally confronted by constraints of poor access to markets and information (FAO, 2017). Moreover, rural communities are at a fundamental disadvantage in their ability to access digital based agriculture knowledge (FAO, 2017). This is attributed to the gaps associated with designing of digital solutions and the research surrounding them (Costopoulou, 2016).

Therefore, this research work is taken up to fill the existing gaps of insights into the needs and preferences of current and potential rural users of agri-marketing mobile applications, by studying adoption and continuance intention of using agri-marketing mobile applications among farmers and rural citizens. Further, to promote its beneficial impact, antecedents and consequences of psychological empowerment by the use of agri-marketing mobile application are investigated. Accordingly, following research questions are explored in the form of three essays comprising the thesis work:

RQ1: a) Which psychological factors influence adoption of agri-marketing mobile-apps by farmers and rural citizens?

b) What is the role of brand credibility in the decision-making process of farmers and rural citizens to adopt agri-marketing mobile-apps?

RQ2: What are the antecedents and consequences of psychological empowerment of farmers and rural citizens by the use of agri-marketing mobile applications?

RQ3: What are the cognitive and socio-technical drivers of continuance intention of farmers' and rural citizens' use of mobile application in agri-marketing domain?

The theoretical and practical contributions of these quantitative studies are manifold. The research questions are answered by proposing integrated models and empirically establishing the relationships between the study constructs as detailed in the sections to follow. Technology needs to be adopted, provide socio-economic benefits and cultivate continued usage for its sustained positive impact. This research work fills the knowledge gap in the domain of agri-marketing mobile applications, by providing useful insights into the needs, preferences and psychological empowerment phenomena of the farmers and rural citizens, the knowledge of which can enable user-centric design and effective deployment of mobile applications in the agri-marketing domain, leading to better adoption, continuance and psychological empowerment of the users.

1.1 Motivation

Being among the first certified organic farmers of the Indian state of Haryana, followed by 15 years of grass root level working in the rural development sector of the Indian states of Haryana, Punjab and Uttarakhand, it came naturally for me to synergistically apply my knowledge of digital technology for socio-economic benefits of the rural sector.

In my pursuit, I found that mobile-based digital technology solutions have significant potential to serve rural market (FAO, 2013) and to benefit the farmers and rural citizens, including those having smaller land holdings (Baumuller, 2018). However, further exploration revealed that the potential is less understood and prior research on digital technology adoption in agriculture is yet to understand the needs of the farmers for a meaningful deployment of digital resource in rural sector (FAO, 2013). In agriculture domain, mobile based services are far from fulfilling their assumed potential and are struggling to sustain and scale up (FAO, 2013) as they focus on supply side and fail to gather proper insights related to farmers (Baumuller, 2018). Further, transforming our food systems to feed the world can be achieved with artificial intelligence and digital agriculture, for which human-centric approach needs to be ensured in designing and implementing through insights, thereby increasing the likelihood of adoption (FAO, 2021).

Major research efforts were hence needed to identify end-user information requirements, preferences and usefulness of data in order to design a relevant mobile app for improving social and economic conditions of agricultural landscapes. This research was hence conducted for contributing to understand the factors that can help design, development and deployment of empowering agri- marketing mobile applications, ease their digital adoption and sustained use by

farmers, especially in the emerging markets. The research enables the mobile apps developers and marketers to include empirically proven factors in their market offerings that may enhance the autonomy, competence and market access of end user farmers.

1.2 Research Outline

The research work comprises of three independently comprehendible essays sequentially linked to each other based on the research context. First essay investigates the factors influencing behavioral intention of the farmers to adopt agri-marketing mobile application. Second essay proposes a framework of psychological empowerment of the rural users of the mobile applications. Third essay comprising of two studies, investigates sustained usage of agri-marketing mobile applications. While the first study of third essay explores the cognitive drivers of continuance intention, second study of the third essay explores its socio-technical drivers. Combined, they provide a comprehensive insight into the behavioral intention of adoption and continuance of agri-marketing mobile application and its role in psychological empowerment of the user. The structure of the thesis is depicted in Figure 1.1 on next page.

Figure 1.1 Thesis structured

Chapter 1

Introduction

Motivation | Research outline | Context | publication

Chapter 2

Adoption of Agri-marketing Mobile Applications in Emerging Markets: Evidence from India

Introduction | Theoretical background | Hypothesis development and conceptual model | Methodology | Results | Discussion | Contribution | Conclusion | Future work

Chapter 3

Antecedents and Consequences of Psychological Empowerment of Users of Agri-Marketing Mobile Applications

Introduction | Theoretical background | Hypothesis development and conceptual model | Methodology | Results | Discussion | Contribution | Conclusion | Future work

Chapter 4

Cognitive Appraisal and Socio-Technical Dimensions as Drivers of Agri-Marketing Mobile-Applications' Continuance Intention

Introduction | Theoretical background and overview of studies

Study1: Cognitive appraisal

Hypothesis development and conceptual model | Methodology | Results

Study 2: Socio-technical dimensions

Hypothesis development and conceptual model | Methodology | Results

Discussion | Contribution | Conclusion | Future work

Chapter 5

Conclusion

Recommendations | Contribution | Future research avenues

Chapter 1 motivates the research, introduces the research questions, presents an overview of the research work and the structure of the thesis. The final section gives the details of the related publications.

Chapter 2 comprise of essay 1. It develops hypothesis pertaining to RQ1 and quantitatively establishes the relationships that are proposed as an integrated model, revealing a deeper insight into the factors that influence rural citizens' adoption and desired experience of mobile based applications. We extend the 'unified theory of acceptance and use of technology (UTAUT2) proposed by Venkatesh (2012) by proposing novel set of influencing factors. Further, UTAUT2 is adapted to modern parlance and novel factor of dynamic personalization is introduced responding to the technological advancements of artificial intelligence. We also respond to the criticism of Kabra (2017) pertaining to the construct of personal innovativeness. Besides, the moderating role of price value and community membership is also studied.

Uncertainty regarding attributes of a product and consequent confusion faced by consumers due to asymmetric information can be neutralized by brands (Keller et al., 2011). Hence, understanding the brands have many potential roles to play as they affect consumer choice behaviour, the mediating role of brand credibility is also investigated quantitatively.

Chapter 3 comprise of essay 2 that answers RQ2. Researchers have missed the important angle of investigating the psychological empowerment impact of mobile applications in their attraction towards the fertile research topics of adoption, diffusion and continuance intention (Mishra et al., 2023; Nguyen et al., 2021; Ambalov, 2018). We fill this research gap by taking up an empirical study to develop a framework on psychological empowerment of the users of mobile applications, by taking a step away from technologically deterministic approach to empowerment approach. Drawing from the recommendations of Pacheco and Montecel (2023) and Bachouche and Sabri (2019) we operationalize the construct as per the dimensions of meaning, competence, self-determination and impact (Zimmerman (1995), using the measures proposed by Spreitzer (1995). In sync with Akhavannasab et al. (2018), our proposed framework includes antecedents and consequences of psychological empowerment by the use of mobile applications. Also, for a deeper insight, we study the mediating role of psychological empowerment on the relationship between its antecedents and consequences. Further, considering the relevance and importance of digital literacy (Ng, 2012.) in the present context, we study the moderating role of digital literacy on the relationship between psychological empowerment and its antecedents.

Chapter 4 comprise of essay 3 and answers RQ3 by conducting two studies. Watson & Spence (2007) posits that consumer behaviour in response to emotions that arise out of the cognitive appraisal provides its comprehensive explanation. However, there is a need for a framework that can predict the occurrence of discrete emotion and its consequence on the use of information technology (Beaudry et al., 2010). Therefore, in study1, we propose the framework comprising dimensions of cognitive appraisal and its relationship with continuance behaviour, mediated by discrete emotion (satisfaction) that arises in response to the cognitive appraisal. In study 2, drawing from the suggestions of Kiron et al. (2016), we explore digital congruence of people, task and technology and respond to the challenge of dynamism of digital landscape. A socio-technical system enabling a rational decision-making pertaining to sustained usage of mobile app for functional utility (agri-marketing) in rural areas is proposed. Further, self-efficacy is suggested to impact individual performance and motivation in digital transformation (Malodia et al., 2023). We therefore, extend the existing research on the construct of self-efficacy and study its mediating role.

Chapter 5 Concludes the thesis work, summarises the key contributions and outlines the future avenues of research.

1.3 Context of the study

The Importance of Indian agriculture in global context is amply reflected by the statistical data presented by Patel et al. (2022) and Mehta et al. (2019). It summarizes that India employs 52% workforce with 86% small-holders, has 7.5% annual growth in farm mechanization and contributes to about 25% of global production of pulses, rice, and cotton. India has a unique challenge of supporting 17% human population with 2.4% of world's geographical area and only 4% of water resources (Singh and Sahni, 2019). The challenge for Indian policymakers is to regain the green-revolution-era dynamism in agricultural sector (Mittal and Mehar, 2012). Strengthening of the agricultural supply chain is needed to address growth challenges which are crucial to feed the growing population and support the economy. Use of technology in Indian agriculture is mostly confined to mechanization of farm operations and enhancement of crop yield. Marketing of farm produce is dominated by traditional, government controlled mechanism. Recent advancements are attempting to utilize digital technology for management of agri-marketing by enabling record keeping on government promoted websites in some states including Haryana. Few

private business entities have started promoting mobile applications for direct purchase of crops from farmers and for their direct to consumer sales.

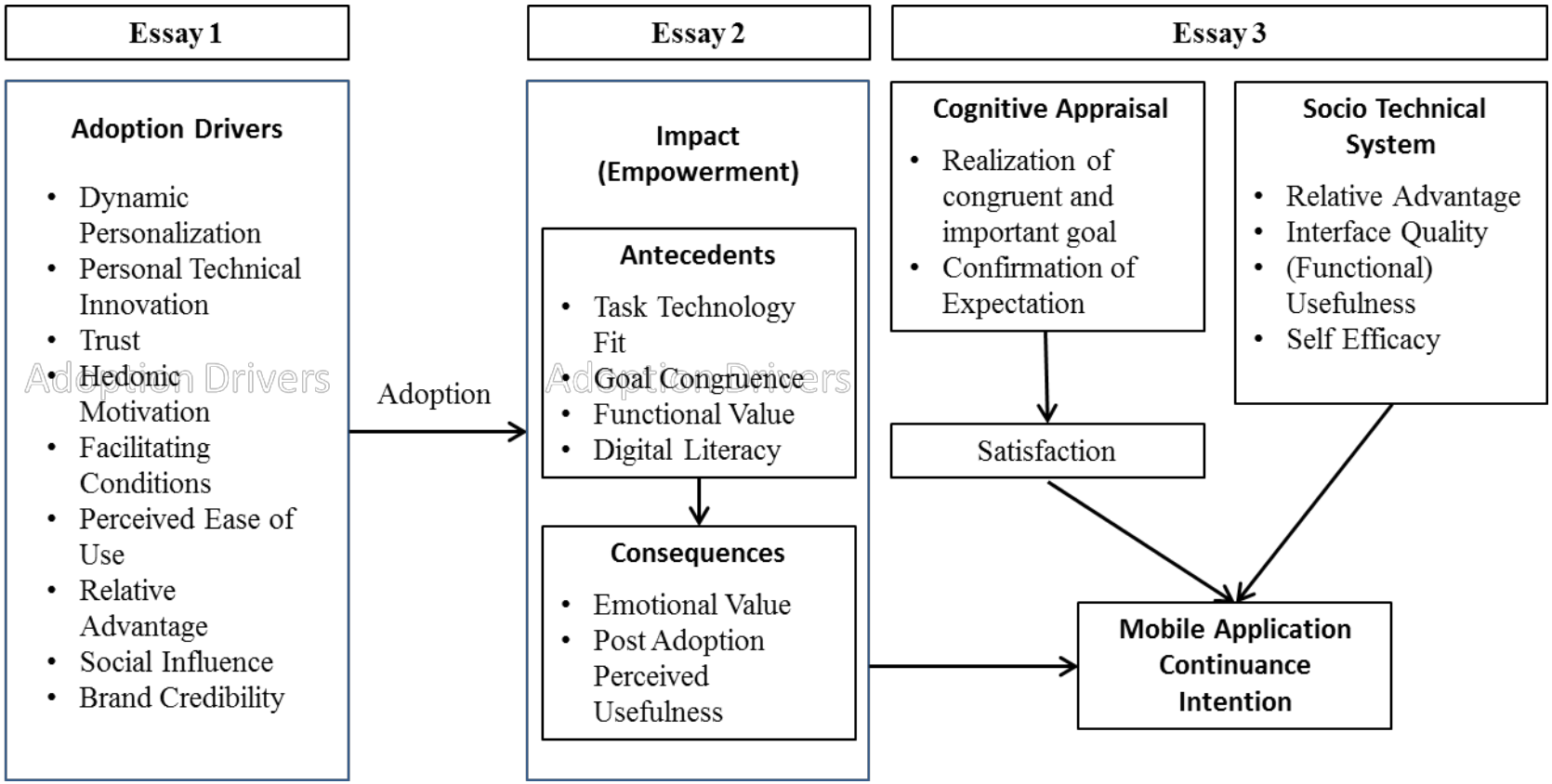
Mobile based ICT is one such technological intervention that can give fresh impetus to the growth in the agricultural sector (Mittal et al., 2010). There have been several mobile based ICT attempts to support Indian agriculture with varying levels of success (Saravanan and Bhattacharjee, 2014) thereby giving fair exposure of mobile apps to farmers. Studies relating to smallholder farmers' organizational link to retail (Trebbin, 2014), identification of information effect on price dispersion in agriculture markets (Parker et al., 2016) and smallholder participation in contract farming (Barrett et al., 2012) are already done in India. Realizing the said importance of agriculture in India and potential benefits of mobile based technology in the times when growth of mobile based transactions is experiencing down-the-line penetration in India (Rana et al., 2023), we base the current study on the agrarian sector of India as suggested by Maduku (2023), attempting to contribute to the rural development of the country in the global interest. Planning commission of India has categorised the country in 15 agroclimatic zones (Khanna, 1989). However, for the sake of uniformity of crop and agri-marketing concerns, research was kept limited to the agro-climatic zone of Trans-Gangetic plains, covering the states of Haryana and Punjab as these farm lands produce crops (pulses, rice, wheat and cotton) critical for domestic and global food and economy.

1.4 Choice of methodology

Methodological considerations and choices were made as per the recommendations of Basias and Pollalis (2018) wherein they have detailed the choices of suitable methodology where digital systems are one aspect of social systems, like in the present case. Present research work involves adaption of established theories to agri-marketing mobile applications domain for investigating the factors driving adoption and continuance of mobile app. Hence to gather insights, data was collected through questionnaire. To establish the applicability of adapted theories and proposed models in the current context, quantitative research was chosen as per aforesaid recommendations. Moreover, literature review also supported this choice (Chakroborty et al., 2022; Purohit et al., 2021; Krismadinata et al., 2019; Alalwan et al., 2018; Akhavannasab et al., 2018).

1.5 Linkage of essays and study constructs

Digital solutions with user-centric design and compatible technology should be deployed in agriculture and food sector for realizing its positive impact, as experienced in other domains such as banking, healthcare and finance. These recommendations published in a report by FAO-UN and ITU in 2021, substantiates the purpose and importance of the current research work comprising comprehensive investigation of the psychological phenomena of adoption and continuance of the digital resources by rural users and its role in their empowerment. A 360 degree deep dive into the psychological phenomena of decision making of a rural consumer is attempted through this research work. Technology adoption is not sufficient, it needs to be put in sustained use to reap its benefits. This sustained usage is possible only if there is any beneficial impact on the users. These aspects can be categorized as adoption, empowerment and continuance in the present context. Hence, the research work comprises of three independently comprehendible essays sequentially linked to each other based on the research context. First essay investigates the factors influencing behavioral intention of the farmers to adopt agri-marketing mobile application. Second essay studies the impact of mobile application in the form of psychological empowerment of the rural users of the mobile applications. Third essay comprising of two studies, investigates sustained usage of agri-marketing mobile applications. Pictorial representation is as follows:


Essay 1
Essay 2
Essay 3
Adoption Drivers
Dynamic Personalization
Personal Technical Innovation
Trust
Hedonic Motivation
Facilitating Conditions
Perceived Ease of Use
Relative Advantage
Social Influence
Brand Credibility
Adoption
Impact (Empowerment)
Antecedents
Task Technology Fit
Goal Congruence
Functional Value
Digital Literacy
Consequences
Emotional Value
Post Adoption Perceived Usefulness
Cognitive Appraisal
Realization of congruent and important goal
Confirmation of Expectation
Satisfaction
Socio Technical System
Relative Advantage
Interface Quality
(Functional) Usefulness
Self Efficacy
Mobile Application Continuance Intention

1.6 Related Publications

Parts of this thesis and off-shoot of literature review have been published and presented at various academic conferences of repute. Application of research methodology in different but related context have been published in refereed journal (ABDC-A).

The initial work of the thesis comprising parts of essay 1, exploring adoption of digital technology in the form of mobile application, were presented at the '7th PAN-IIM World Management Conference' held at IIM Rohtak during 12-14 December, 2019.

Thereafter, parts of the essay 2, investigating framework for psychological empowerment of the user of the agri-marketing mobile app were presented at '3rd Annual India Public Policy Network Conference' held at ISB Hyderabad during 26-27 March, 2021.

Further, parts of essay 3 and excerpts of conceptual applications of overall research work were presented at ANZMAC 2022, held at Perth (Australia), during 5-7 December 2022 and 2023 AMA Winter Academic Conference, held at Nashville (USA), during 6-12 February 2023

Eventually, drawing from the so far experience, a paper applying the designed research methodology and quantitative assessment criteria in related but distinct domain was published in the 'Journal of Consumer Behaviour' (ABDC-A) in July 2023.

Chapter 2
Adoption of Agri-marketing Mobile Applications in Emerging Markets: Evidence from India

2.1 Introduction

Nearly 80% percent of the world's poor live in rural areas, and many depend on agriculture for their livelihood (World Bank report, 2019). Growth in agriculture considerably impacts poverty reduction reported to be twice that of manufacturing (World Bank report, 2023). As per the Food and agriculture organization of United Nations (FAO) strategic framework 2022-31 (Mekouar, 2021), digitalization is seen as an enabler for agri-food system transformation. Therefore, mobile based ICTs (Information and Communications Technology) can potentially address development and income concerns of agriculture especially in the emerging markets. Moreover, in emerging economies, information technologies have the potential to become a catalyst for socioeconomic development (Park et al., 2009). In recent times, mobile phones are considered the highest scale of consumer information technology (Tamilmani, et al., 2019). Synergy of internet technology and mobile terminals is extensive and significantly impacts a person's life and consumption (Zhong and Chen, 2023).

Utilization of Mobile based ICT solutions such as mobile applications (mobile apps) can assist to meet the contemporary agricultural challenges. App Annie (2023), reports 255 billion mobile application downloads globally. Moreover, it is largely fueled by the emerging markets with consumer expenditures to the tune of USD 120 billion. Mobile apps have strong diffusion in all major sectors such as personal finance, retail, banking, and travel. However, when it comes to agriculture, mobile apps are finding limited adoption among the targeted audience of farmers (Manimekalai, 2013). The potential remains vastly unexplored and developers have majorly failed to understand the needs of the farmers (FAO, 2013). There is a mismatch between services offered and its interpretation by the farmers (Wyche and Steinfield, 2016) resulting in agri-marketing marked as an area of concern for mobile apps adoption (Mittal et al., 2010). Agriculture sector mobile apps have not achieved desired scales of usage due to the unresolved barriers faced by the

farmers (Deichmann et al., 2016). Dey et al. (2016) in his study found that marketers of mobile tech were not directly engaging with farmers and therefore non-related data was served. Baumuller (2018) reports their limited impact on trade patterns in emerging markets. Sunidhi et al (2018) conclude that needs of farmers are not captured in totality and that mobile apps are not dynamic. Bhaskar (2017) expressed concern about credibility, currency and matching of the content with the needs of the farmers. New technology alone is insufficient for successful adaptation in agriculture (Hellin et al., 2016). Providers resort mostly to a data dump tendency in agricultural mobile apps (Baumuller, 2018). Consequently, gains get obstructed by users' (farmers) non-acceptance and unwillingness to use the technology.

Alalwan et al. (2018), suggest a need to investigate the factors that influence the adoption of agricultural mobile apps (agri mobile apps). Nevertheless, hardly any studies have examined the behavioral factors that may influence farmers' willingness and ability to adopt and use the technology of agri mobile apps. Additionally, with the proliferation of mobile apps and choices at hand with the farmers, brand credibility may influence the decision making (Jain et al., 2022) regarding adoption of mobile apps. For various reasons such as better marketing, pooling of agri-produce and access to resources, farmers associate themselves in communities (such as farmer producer organizations (FPOs) in India). While the impact of social influence on behavioral intention has been studied in the past, the influence of such community membership on digital adoption is yet to be established. Additionally, the mobile app adoption may include some financial cost in the form of mobile phone purchase, software service charges and transaction charges which are not required in availing traditional agri-marketing services. Studies done in the past have not sufficiently examined the role of the price paid to avail digital transformation against the advantages it may offer in adopting agri mobile apps.

We draw on extending the UTAUT2 (Venkatesh et al., 2012) model in the agri-marketing area of research to throw light on factors that may impact adoption of agri mobile apps among farmers. In recent times of artificial intelligence advancement in digital technology factors such as dynamism and personalization are finding increasing relevance in the era of technological expansion (Tong, Luo and Xu, 2020). Therefore, we include dynamic personalization along with personal technical innovativeness in the proposed extended UTAUT2 model. In the process, we answer the criticisms of Kabra et al (2017). We replace performance expectancy (PE) with 'Relative Advantage' as mobile application users are expected to benchmark performance against

existing traditional practices. We propose trust as another key influencing factor that may affect adoption of agri-mobile apps among farmers drawn from fact that monetary transactions and future cash flows from farming may have implications on usage of those mobile apps. Furthermore, with the proliferation of mobile apps and choices at hand with the farmers, brand credibility may influence the decision making (Jain et al., 2022) regarding adoption of mobile apps. Therefore, we investigate the possible mediating role of brand credibility (BRC) on the relationship between the proposed influencing factors and behavioral intention to adopt agri-marketing mobile apps. To capture the role of financial cost in agri mobile apps adoption the current study explores the moderating role of price value on the relationship between relative advantage and behavioral intention. Additionally, we investigate the moderation of community membership on the relationship between social influence and behavioral intention in the current study.

Therefore, the present research proposes the following research questions:

RQ1: Which factors drive agri-marketing mobile app adoption among farmers in emerging economies?

RQ2: Does brand credibility mediate the relationship between the identified factors and behavioral intention to adopt agri-marketing mobile app adoption in rural areas of emerging economies?

RQ3: Does community membership moderate the relationship between social influence and behavioral intention to adopt agri-marketing mobile app adoption in rural areas of emerging economies?

RQ4: Does price value moderate the relationship between relative advantage and behavioral intention to adopt agri-marketing mobile app adoption in rural areas of emerging economies?

The present research adds to the technology adoption literature in general and specifically in emerging markets that are mostly under-researched (Sudhir et al., 2015). From a practical standpoint, this study's results will help firms design and market mobile apps that find higher acceptance among the farmers. In the following sections, we discuss the theoretical framework and develop the hypotheses. We follow it up by describing the context of the study, data collection and analysis. In the final sections, we describe the theoretical contributions along with managerial implications, conclusion, and directions for future research.

2.2 Theoretical support

2.2.1 Technology Acceptance Theories and Models

Technology acceptance signifies the initial positive inclination to use the technology. Technology acceptance models are useful in understanding user acceptance, which is crucial for the proliferation of any technological platform (Gunasinghe et al., 2019). Developing an understanding of the factors influencing individuals' technology adoption decisions and continued usage is paramount to the success of new technologies (Venkatesh et al., 2003). Research in technology acceptance caught attraction of researchers since the proposition of Theory of Reasoned Action –TRA (Fishbein and Ajzen, 1975). However, TRA did not popularize for prediction of information systems (Gunasinghe et al., 2019). Predominant models and theories that followed TRA were: Diffusion of Innovation theory (Rogers, 1983), Theory of Planned Behavior (Ajzen, 1985), Social Cognitive Theory by Bandura (1986), Technology Acceptance Model – TAM (Davis, 1989), PC Utilization model by Thompson (1991), Motivational Model (Davis et at, 1992), UTAUT (Venkatesh et al., 2003) and UTAUT-2 (Venkatesh et al., 2012). TAM proposed by Davis (1989), which was based on TRA is among the first popular and widely adopted and adapted information systems adoption model (Legris et al., 2003). UTAUT (Venkatesh et al., 2003) is suggested to be the most suitable model to study technology adoption intention of the rural population as it integrates technological and social factors (Zuiderwijk et al., 2015).

TRA suggested that attitude, influenced by inferential beliefs and informational beliefs become the basis of behavioral intentions along with the subjective norms (Fishbein and Azjen, 1975). Davis (1989) extended TRA to TAM. TAM posits that perceived ease of use (PEOU) and perceived usefulness of the technology (PU) influences attitude. Theory of Planned Behavior (Azjen, 1985), posits that intention is influenced by attitude, subjective norm, and perceived behavioral control (PBC). Venkatesh (2003) analyzed eight predominant models and found several overlapping or closely related constructs floated among these models. He amalgamated these eight models that explained between 17 to 53% of the variance in users' intention to use Information Systems into UTAUT. It outperformed all the eight models using the same data explaining 50% in technology use (Venkatesh et al., 2012). UTAUT posits that performance expectancy, effort expectancy, social influence and facilitating conditions influence behavioral intention and actual use (Venkatesh et al., 2003).

As information technology stretched towards consumers, primarily through mobile phone penetration, research activities were also extended to individual context (Tamilmani, Rana and Dwivedi, 2020). Previous studies from 2003 to 2014 reveal that the UTAUT model has been empirically tested and validated in different settings (Venkatesh et al., 2016). However, UTAUT missed a key element- 'individual' characteristics in determining behaviors (Dwivedi et al., 2017), which was covered in UTAUT2 (Venkatesh et al., 2012) as it was developed with 'individual' optic. UTAUT2 is suitable for proposing variables that may predict acceptance of technology in user context (Alamanda et al., 2017). As a concept and model, it is widely appreciated model to express user acceptance of technology (Purohit et al., 2021; Krismadinata et al., 2019). UTAUT2 included Hedonic Motivation, Price Value and Habit into UTAUT. The goal of the UTAUT2 is to predict the behavioral intention to use a technology in an individual context which makes UTAUT2 suitable for this study.

2.2.2 Extending UTAUT2 to mobile applications

In comparison to the other channels, mobile technology is high in effectiveness and low on cost in rural areas (Mtega and Ronald, 2013). The propositions of UTAUT and UTAUT2 have been used to understand user intention in several mobile based technological domains including mobile payments (Kapoor et al., 2015), mobile health (Dwivedi et al., 2016), mobile banking (Alalwan Dwivedi and Rana, 2017), mobile internet (Alalwan et al., 2018). UTAUT explained considerable behavioral intention variance, still some relationships theorized there, may not be suitable for all contexts as technology adoption is contextual (Jelinek et al., 2006). At the same time, new relationships and constructs may be important for explaining information technology acceptance with evolving time and context dynamism. A study regarding adoption of mobile banking for Jordanian bank customers, extending UTAUT2 with Trust (Alalwan et al., 2017) and Risk (Alalwan et al., 2018) increased R^2 value to 64%, thereby improving the predictive power of UTAUT2. This supports the view that UTAUT2 even though most suitable basis for studying factors influencing individual technology adoption has ample scope for improved adaptation in emerging research contexts. In this study, the extended Unified Theory of Acceptance and Use of Technology **(**UTAUT2) proposed by Venkatesh et al., (2012) is adapted to study Behavioral Intention (BI) to adopt mobile apps in an agri marketing perspective, with a focus on the emerging markets. It further recognizes the advancement of mobile based ICT which includes artificial

intelligence, aiming to deliver more relevant services to users (Tong, Luo and Xu, 2020) and extend its effect across societies (Chang et al., 2022).

2.3 Hypotheses development and conceptual model

2.3.1 Dynamic Personalization

Dynamic is characterized by constant change, activity or progress. Personalization is defined as a process that changes the functionality, interface, information content, or distinctiveness of a system to increase its personal relevance to an individual (Blom, 2000). User context (needs, preferences, interests, expertise, tasks etc.) is the means of personalization (Goker et al., 2002). Personalized systems have met great success in emerging markets in areas like hospitality, advertising, retail and education by increasing emotional and physical comfort and helping in decision making (Callan et al., 2003; Buhalis, 2015). Considerations under personalization comprise cognitive abilities, individual differences, behavior history, subject domain, work tasks, work environment and the accompanying changes in them over time (Callan et al., 2003). Artificial intelligence, which involves autonomous decisions for personalization of service, is inevitable as it helps in the value creation process (Gajdosik, 2019). User behavior is dynamic in nature and any underlying model should be sensitive to variance and changes to replicate user (Montebello, 2019). It is ever so important to understand customer behavior and accordingly create a frictionless experience for the customer (Schrotenboer, 2019). Mobile based services resort to 'push' based approach (Baumuller, 2018) leading to failure in scaling up (FAO, 2013). Push methods are no more effective, causing customer resistance which can be overcome by personalization (Instone, 2000). Personalization minimizes users' information access cost and improves experience making them loyal (Zanker et al., 2019). Personalization is often a long-term process (Peppers and Rogers, 1995) during which technologies may advance, thereby influencing change in consumer behavior (Thomas and Gupta, 2005). Mobile apps mostly require updating due to release of updated versions from time to time. Therefore, for any personalization to remain relevant and effective with every updation in case of mobile apps, personalization has to be a dynamic feature to keep the mobile app compatible with the users. Personalization promotes acceptance and adoption of ICT (Oulasvirta and Blom, 2007). We define 'Dynamic-Personalization' as "a constant process of sustained and continuous befitting of functionality, interface, content and distinctiveness of a system to evolving personal relevance entailing cognitive abilities, individual differences, subject domain, work tasks and work environment".

Further, we extend this argument of criticality of dynamic personalization by proposing that it may promote adoption and acceptance of agri-marketing mobile apps among the farmers. Therefore, it is accordingly hypothesized that:

H1: Dynamic Personalization will positively impact farmers' intention to adopt agri-marketing mobile apps

2.3.2 Trust

Technology trust is a recent phenomenon even though research in trust as an independent construct began more than 70 years ago. Simpson (2007) opines that trust is a multidimensional and complex construct which makes it challenging to operationalize. Consideration and analysis of trust depends on dimensions applied in the context (Kammerlohr and Paradice, 2023) to study relationship of humans and evolving modern technology (Ejdys, 2018). Pavlou (2002) defines technology trust in terms of adherence to technical standards. The initial definition of technology trust was proposed by Lippert (2001) expressing it in terms of individual willingness of getting influenced by technology based on its usefulness, credibility, predictability and individual preferences. Lippert (2006) posits that there are two forms of trust that are crucial for digital technology adoption: 1) Interpersonal Trust and 2) Technology Trust. Interpersonal trust entails expectation that the trusted person will not take undue advantage of situation and will be dependable, ethical, and will fulfill commitments in a socially appropriate way (Gefen, 2003). It is all the more crucial in the case of digital platforms because contrary to face to face interactions, there is no way to judge a person across the digital platforms. While Lippert (2006) discusses trust in an organizational context, we extend this proposition to an individual context, where interpersonal trust refers to the mutual trust between all the stakeholders of the agricultural value chain, interacting with each other through the mobile app.

An individual's acceptance of vulnerability to information systems, their reliability and predictability establish its technology trust (Lippert, 2006). It gains or loses its strength and direction with each interaction a user has with the technology and adds to his experience. Initial trust depends on the individual's judgment until experience forms (McKnight et al., 2011). Trust in technology positively affects the behavioral intention to use IT (Kabra et al., 2017). A higher level of trust will heighten the intention to use a digital platform (Gefen, 2003). Trust is approved as a determinant of intention to adopt mobile banking (Alalwan et al., 2017).

It is therefore hypothesized that:

H2: Trust will positively impact farmers' intention to adopt agri-marketing mobile apps

2.3.3 Personnel Technical Innovativeness

Progressive farmers tend to adopt modern technology better than other small farmers (Brembridge, 1986). An individual's Personal Innovativeness influences their cognitive and decision-making processes (Roger, 1995). An individual with more personal innovativeness tends to develop a more positive attitude and greater belief toward the adoption of IT (Kabra et al., 2017). Gatignon and Robertson (1985) argue that personal innovativeness is a domain-specific characteristic and not a general trait of an individual's personality. Personal innovativeness in ICT context is defined as "the willingness of an individual to try out any new information technology" (Agarwal and Prasad, 1998). However, there are contradictory findings regarding influence of attitude and innovativeness on behavioral intention (Singh et al., 2020). We argue that this difference is contextual. Simarmata and Hia (2020) found Personal Innovativeness in IT (PIIT) domain significant in determining behavioral intentions to adopt IT. PIIT is referred to as the willingness of an individual to try out any new information technology (Agarwal and Prasad, 1998). However, in case of farmers, narrowing the vision to IT domain may be too limiting, especially when there is a large number of non-user farmers. Instead, we propose that a broader viewpoint of personal innovativeness towards technology in general will be a more suitable factor in the agri-marketing technology-adoption context. The concept of technology proposed here subsumes all types of technology including mobile apps. Hence, we propose Personal Technical Innovativeness to stress the need to look at personal innovativeness in a relatively broader sense. A consumer with innovativeness favors a new technology and expects to be more satisfied with the new services (Oliveira et al., 2016). It is therefore hypothesized that:

H3: Personal Technical Innovativeness will positively impact farmers' intention to adopt agri-marketing mobile apps

2.3.4 Relative advantage

Relative advantage refers to the belief of a person regarding the benefits of the contemporary technology in comparison to the previous practice(s) adopted for the work accomplishments (Moore and Benbasat, 1991). Positive influence of relative advantage on behavioral intentions has been observed in earlier studies done by Shareef et al. (2012) and Rokhman (2011). Relative advantage is argued to be the most decisive factor in the rural context determining adoption of most of the technological innovations (Wilkinson, 2013). It has been

shown to positively impact adoption of mobile banking (Al-Jabri, 2012) and broadband adoptions in rural areas (Hill and Troshani, 2011). Since most of the farmers reside in rural settings; we therefore propose to extend this relationship between relative advantage and technology adoption to agri marketing mobile apps adoption. It is therefore hypothesized that:

H4: Relative advantage will positively impact farmers' intention to adopt agri-marketing mobile apps

2.3.5 Perceived Ease of Use (PEOU)

The effort, as a resource, is finite and capable of allocation to various ends (Radner and Rothschild, 1975). Users may hence tend to prefer mobile apps that are free from much effort or in other words – easy to use. PEOU refers to users' perception of the system being easy (Davis, 1989). PEOU is found to be an essential factor in various studies relating to technology adoption under different domains (Liebana and Cabanillas, 2014). Design of mobile apps plays an important part in establishing a user-friendly perception and it can expedite the adoption process (Baishya and Samaliya, 2019). Ease of use has an affirmative effect on intentions to use technology (Baabdullah et al., 2016). Farmers would readily use m-government services to get relevant information if it requires less physical and mental efforts (Mandari and Chong, 2018). Accordingly, self-induced perception of a farmer about the ease of use of mobile apps is likely to influence his intention to adopt the mobile apps. It is therefore hypothesized that:

H5: PEOU will positively impact farmers' intention to adopt agri-marketing mobile apps

2.3.6 Social Influence

Social Influence refers to "the extent to which an individual perceives that important others believe he or she should apply the new system" (Venkatesh et al., 2003). Backing by people around the user can contribute to the behavior intention to use a technology (Alalwan et al., 2017). Impact of social influence on intention is established in various business domains such as online banking (Alalwan et al., 2016), adoption of e-government (Gupta et al., 2008), online air ticketing (Escobar et al., 2014), online shopping (Lian and Yen, 2014) and e-library (Awwad, 2015) by extant research. A person is influenced by his/her family, friends and colleagues (Baishya and Samaliya, 2019). Farmers are believed to have high social considerations and are interested to create a strong sense of belonging in the local community (McManus et al. 2012). Therefore, it is hypothesized that:

H6: Social Influence will positively impact farmers' intention to adopt agri-marketing mobile apps

2.3.7 Facilitating Conditions (FC)

FC refers to the belief that the infrastructure exists to support use of system (Venkatesh et al., 2003). In the present context, FC can be defined as the availability of support in the form of accessible knowledge and assistance to adopt and use the mobile app for agri-marketing related activities. Drawing from Thong et al (2011), mobile apps may require particular knowledge or skill for activities like downloading, installing, registering and accessing the desired function, which may require presence of facilitating conditions for farmers. Jadil et al. (2021) has observed that FC-BI relationship is not always significant while positive influence of FC on BI was established in the case of mobile banking (Alalwan et al., 2015). Facilitating conditions are expected to contribute affirmatively to the intention of the farmers to adopt mobile apps. It is therefore hypothesized that:

H7: FC will positively impact farmers' intention to adopt agri-marketing mobile apps

2.3.8 Hedonic Motivation (HM)

Intrinsic utilities may have a crucial role in individuals emerging systems' adoption intention (Van der Heijden, 2004). Intrinsic utilities were conceptualized as Hedonic Motivation by Venkatesh et al. (2012) and included in UTAUT2 as a determinant of behavioral intentions for technology adoption. It refers to the motivation to use the technology because of the psychological and emotive pleasures gained by using the technology. Further, it stimulates and significantly influences the intention to use the technology (Wong et al., 2019). It is a key determinant of technology acceptance and use (Brown and Venkatesh, 2015). The direct relationship between HM and behavioral intentions was established in the case of mobile banking by Alalwan et al (2014). HM is an important inclusion in the technology adoption model (Tamilmani et al., 2019). We argue that the pleasure derived from the use of mobile apps will have positive influence on its adoption in an agri-marketing context. It is therefore hypothesized that:

H8: Hedonic Motivation will positively impact farmers' intention to adopt agri-marketing mobile apps

2.3.9 Mediating effect of brand credibility (BRC)

Brands have many potential roles to play as they affect consumer choice behavior. Uncertainty regarding attributes of a product and consequent confusion faced by consumers due to asymmetric information can be neutralized by brands (Keller et al., 2011). Companies are concerned about credibility as consumer perceptions influence new product launches and sales (Hanzaee and Taghipourian, 2012). Brand credibility is defined as the believability of the product position information contained in the brand (Erdem and Swait, 1998). Marketing of agri-produce is the basic life sustenance and fundamental economic activity of farmers. They may not venture into any channel of agri-marketing that is difficult for them to believe. For a successful transaction based on deals happening through mobile app, there needs to be sufficient supporting infrastructure and facilitating conditions for farmers. Therefore, in the present context brand credibility plays an important role in ascertaining the believability regarding availability of necessary supporting infrastructure and facilitating conditions that are important for deliverance of the deal. Brand credibility was found to influence purchase intentions in tourism context (Jun, 2020). Relationship between a brand and a consumer may have cognitive as well as affective influence on consumer's evaluation of product and consequent choice making (Molinillo et. al., 2022). Brand credibility reduces risk of purchase, consumer uncertainty and influences quality perceptions (Jain et al., 2022). Quality is not the sole evaluation of outcome. It is evaluated on technical as well as functional fronts through dimensions of material, facility, and personnel (Parasuraman et al., 1985). Accordingly, we argue that in the present context while brand credibility may influence decision making of continued usage of agri-marketing mobile app, brand credibility itself may be influenced by drivers of adoption of mobile app proposed in the current study. It is therefore appropriate to examine the possible mediation effect of brand credibility on the relationship between adoption intention and its drivers. Even though mediation analysis has

additional benefit of a deeper understanding of behavior (Chakraborty et al., 2022), researchers have not yet studied mediation effect of brand credibility on the relationship of adoption of agri-marketing mobile app and its drivers. We therefore hypothesize that:

H9a: Brand Credibility in agri-marketing mobile apps mediates the relationship between dynamic personalization and intention to adopt agri-marketing mobile apps.

H9b: Brand Credibility in agri-marketing mobile app mediates the relationship between trust and intention to adopt agri-marketing mobile apps.

H9c: Brand Credibility in agri-marketing mobile app mediates the relationship between personal technical innovativeness and intention to adopt agri-marketing mobile apps.

H9d: Brand Credibility in agri-marketing mobile app mediates the relationship between relative advantage and intention to adopt agri-marketing mobile apps.

H9e: Brand Credibility in agri-marketing mobile app mediates the relationship between perceived ease of use and intention to adopt agri-marketing mobile apps.

H9f: Brand Credibility in agri-marketing mobile app mediates the relationship between social influence and intention to adopt agri-marketing mobile apps.

H9g: Brand Credibility in agri-marketing mobile app mediates the relationship between facilitating conditions and intention to adopt agri-marketing mobile apps.

H9h: Brand Credibility in agri-marketing mobile app mediates the relationship between hedonic motivation and intention to adopt agri-marketing mobile apps.

2.3.10 Moderating Role of Community Membership

Sense of community is defined as a feeling that members have, of belonging to the group and shared faith that their needs will be met through their commitment together (McMillan and Chavis, 1986). Baruwa et al. (2016) in a Nigerian study found that the members of a cooperative association had better socio-economic characteristics compared to the non-members. Community membership is expected to have a significant influence on the decision making (Anderson, 2009). Critical difference between members and non-members of a group is in the feeling of sharing personal relatedness and identification as an entity working towards common tasks. This makes community membership a powerful force to create interdependence (Burroughs et al., 1998). Farmers are increasingly associating with/as farmer-producer organizations, farmer clubs, and interest groups. Members trust other members' recommendations and they effectively involve

with the group and constantly evaluate their association with the group (Qu and Lee, 2011). The adoption of an agri-marketing mobile app may find positive traction with a farmer if the other members of the group opine favorably about it. The opposite of it is also equally likely to happen as community members' negative viewpoints will act against the likely adoption behavior. Hence, holding a community membership likely moderates the relationship between social influence and behavioral intentions concerning the adoption of an agri marketing mobile app by a farmer. Hence it is hypothesized that:

H10: Community Membership will positively moderate the impact of social influence on farmers' intention to adopt agri-marketing mobile apps

2.3.11 Moderating Role of Price Value

Price Value, proposed in the original UTAUT2 model refers to the tradeoff between perceived benefits and monetary cost (Venkatesh et al., 2012). Purchasing and recurring cost can play a significant role in decision making situations especially where monetary constraints are prevalent (Baishya and Samalia, 2019) such as in the context of farmers. Price value may be of importance in altering farmers' perceptions of relative advantage as far as adoption of agri marketing mobile apps is concerned. This is because, M – apps adoption will certainly involve monetary investments from the farmers' side. The presence of price value will strengthen the relationship between relative advantage and farmers' intentions to adopt agri marketing mobile apps. Therefore, we hypothesize:

H11: Price Value will positively moderate the impact of relative advantage on farmers' intention to adopt agri-marketing mobile apps

2.3.12 Control variables

Demographic characteristics may assume significance when used as control variables (Sun et al., 2009). In several prior works, a strong correlation was found between the payment-behavior of consumers and demographic characteristics (Connolly and Stavins, 2015). They were found to influence mobile payment intention in the study done by Rouibah et al. (2016). Hence we used the demographic variables of educational qualification, income, age and gender while studying intention to adopt agri marketing mobile apps in the rural sector of emerging economies.

The hypothesized integrated research model is presented in Figure 2.1:

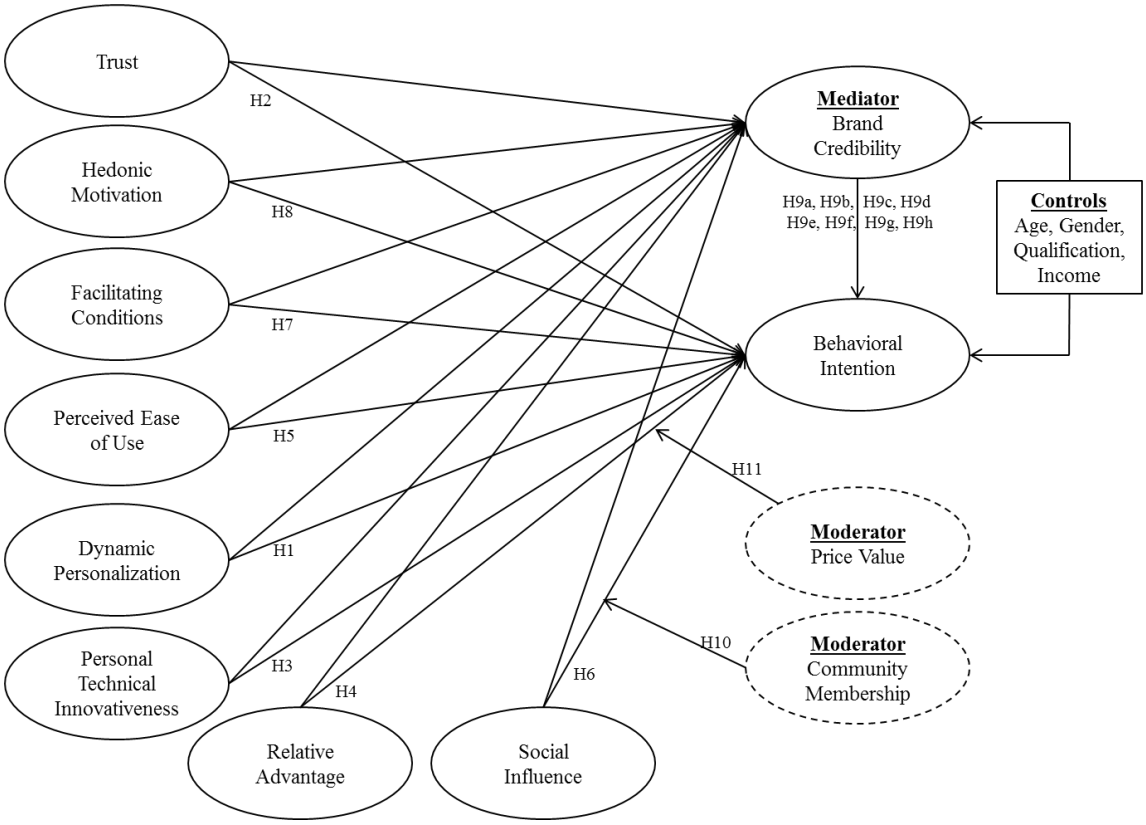


Figure 2.1 Research Model

2.4 Methodology

2.4.1 Measures

Seven-point Likert scale, ranging from, strongly agree to strongly disagree was used to measure 12 constructs with 46 items (Table 2.3). All the scales were taken from prior studies. Scale for SI and HM were retained from original UTAUT2 model (Venkatesh et al., 2012) while PEOU and FC were taken from UTAUT model (Venkatesh et al., 2003). Items for PTI were drawn from Aggarwal and Prasad (1998) along with Patil et al. (2020). Trust and BI scales were taken from Alalwan et al. (2017). Measure of Dynamic Personalization was adopted from Lee and Lin (2005) and Wang et al. (2017). Relative Advantage scale was drawn from Moore and Benbasat (1991). Scale for Community Membership was adopted from Glynn (1981) and that for Price Value from original UTAUT2 model (Venkatesh et al., 2012). Brand Credibility scale was taken from Baek and King (2011). Questions related to demographic data including age, gender, income and education level were also asked toward the end of the questionnaire.

2.4.2 Sample and data collection

Considering that the focus of this study is on exploring factors that can impact behavioral intention of farmers regarding adoption of mobile apps, the target population comprises the farmers of Punjab and Haryana (two states in India that contribute the bulk of agri-produce to central pool) villages, falling under the agro-climatic zone of Trans-Gangetic plains of norther India (Khanna, 1989). From these states, three districts were selected based on their representativeness to the cropping pattern of the agro-climatic zone. The farmer list was gathered from concerned agri-market field functionaries of the Sirsa and Kurukshetra districts of Haryana and Muktsar district of Punjab. From the list obtained, we randomly selected 500 farmers. The participant farmers were potential or current users of mobile apps. All these farmers were personally contacted via telephone and their consent was obtained to participate in the survey for data collection. Next, these farmers were divided randomly into 50 groups comprising 10 farmers per group. Each group was met separately and the questionnaire was explained in their local language. Five popular agri-mobile-apps were taken based on number of downloads from Google play store. Their static images of home screen with available functionalities were displayed to each group. Before the survey, questionnaire was validated through a pilot study by allocating 30 questionnaires (Alalwan et al., 2018) to farmers. They were requested to go through the questionnaire and present their feedback freely regarding any confusion, problem, and clarity of questions. Their feedback was included in design of final questionnaire and its translation into local language for final data collection.

2.4.3 Data analysis

After cleansing and checking, 496 valid responses were found, which were used for data analysis. The demographic profile of the respondents is given in Table 2.1. SPSS v 23 and AMOS v 23 were used for two-step data analysis. Structural equation modeling (SEM) analysis was done in two stages – by evaluating measurement model followed by structural model as per the suggestions of Anderson and Gerbing (1982). Cronbach's alpha, composite reliability was used to evaluate construct reliability (Anderson and Gerbing, 1988). CFA was performed to assert validity of the research instruments and to analyze measurement model (Hair et al., 2010). Common method bias analysis was done in accordance with the suggestions of Harman (1976) and Podsakoff et al. (2003).

Table 2.1: Demographic profile

Measure	Category	%
Gender	Male	85
	Female	15
Age (years)	21-40	40
	40-55	40
	55-70	20
Frequency of Agri mobile app visit	Daily	5
	Weekly	80
	Monthly*	15
Educational Qualification	Post-Graduate	10
	Graduate	50
	Under-graduate	40
	>5	20
Number of Agri mobile app explored	1	20
	2-3	50
	>3	30

(These are the non-users who visit the mobile app out of curiosity)*

2.5 Results

2.5.1 Data normalcy

The data normalcy was first established. There was no case of missing data. The Skewness and Kurtosis values were within the tolerance limits of +3 to -3 (Chakroborty et al., 2022) establishing that the data were distributed normally (Hair et al., 2021). Further, multicollinearity test was conducted. VIF for all independent variables (Range: 1.011-1.299) was also within the recommended range of less than three. Hence data of 496 participants was utilized for further analysis. The descriptive statistics of constructs presented in the current study and demographics are presented in Table 2.2.

2.5.2 Common method bias

Initially, Harman single factor test was used to analyse common method bias. According to the SPSS output, 14.177% of the total variance was explained by a single factor which is well below the threshold of 50%. To further establish that the common method bias is not a matter of substantial concern in the present study, latent common method factor (Podsakoff et al., 2003) was introduced in the CFA model. After relating the latent common factor to all the items in the model,

model fitness was assessed. The change in chi-square was only 0.301 against change of one degree of freedom. This is far less than the critical value of 3.84 at p-value of 0.05. Hence it is safe to conclude that common method bias is not a matter of concern for further data analysis.

2.5.3 Measurement model analysis

Confirmatory factor analysis was done to measure validity, reliability and fit indices. All the factor loading values were found to be greater than 0.7 (Table 2.3) making the items eligible for further analysis. Model fit indices were found to be within recommended limits as cmin/df = 1.092, TLI = 0.996, CFI = 0.997, RMSEA = 0.14 and SRMR = 0.0227 (Tabacknick and Fidell, 2007). Further, table 2.4 presents composite reliability (CR) and Average variance explained (AVE) values. CR values for all the constructs were found to be greater than 0.7. AVE valued were found to be greater than 0.5. Reliability and convergent validity was hence established. Also, the square root of AVE for all the constructs was greater than the inter-correlations between constructs (Table 2.4). Hence, discriminant validity was established (Hair et al., 2017; Forner & Larcker, 1981). It was further estimated by applying heterotrait-monotrait (HTMT) method, the values of which are presented in Table 2.5. All the values were within the recommended threshold limit of 0.85, further establishing discriminant validity (Henseler et al., 2015) .

Table 2.2: Mean, SD and Correlation of study variables and demographics

VAR	Mean	SD	Age	Gender	Income	Qual	TRS	PTII	PRS	SIFI	FCS	BINI	HMNI	RADI	EOUI	PCVI	CMBI	BRCI
Age	3	1.435	1															
Gender	1.14	0.344	-0.081	1														
Income	3.07	1.38	0.019	-0.047	1													
Qual	3	1.399	-0.04	0.038	-0.024	1												
TRSI	3.91	1.457	-0.046	-0.075	0.047	-0.009	1											
PTII	3.82	1.418	-0.056	-0.066	0.024	0.033	-0.015	1										
PRSI	3.99	1.492	-0.009	-0.058	-0.083	-.088*	-0.006	-0.063	1									
SIFI	3.99	1.48	-0.119**	0.031	0.01	-0.033	-0.056	0.093*	-0.005	1								
FCSI	4.16	1.514	-0.06	-0.027	0.025	0	0.052	0.05	0.057	-0.03	1							
BINI	4.01	0.75	-0.084	-0.013	0.022	-0.054	0.271**	0.288**	0.259**	0.264**	0.283**	1						
HMNI	4	1.464	-0.041	-0.034	0.031	0	-0.009	0.012	-0.064	0.036	-0.053	0.221**	1					
RADI	3.98	1.421	0.114*	0.01	-0.001	-0.042	0.02	0.018	0.051	-0.007	-0.037	0.239**	-0.012	1				
EOUI	3.95	1.432	-0.001	-0.055	0.01	-0.03	0.038	0.066	0.062	0.036	0.032	0.287**	-0.001	0.051	1			
PCVI	3.49	1.375	0.019	-0.04	0.066	0.013	0.093*	0.131**	0.035	0.084	0.056	0.401**	0.021	0.336**	0.075	1		
CMBI	3.51	1.333	-0.085	0.062	-0.024	-0.028	0.065	0.115*	0.031	0.339**	0.031	0.320**	-0.028	0.122**	0.039	0.353**	1	
BRCI	3.03	0.782	-0.081	-0.045	-0.003	-0.048	0.257**	0.354**	0.274**	0.262**	0.236**	0.736**	0.240**	0.242**	0.294**	0.275**	0.248**	1

*(*p<.050; **<.010; ***<.001)*

(Qual: academic qualification; TRS: trust; PTII: personal technical innovation, PRS: dynamic personalization; SIFI: social influence; FCS: facilitating conditions; BINI: behavioral intention; HMNI: hedonic motivation; RADI: relative advantage; EOUI: ease of use; PCVI: price value; CMBI: community membership; BRCI: brand credibility

Table 2.3: Items and loadings

Construct and Items		Mean	SD	Loadings	Source
Behavioural Intention					
I intend to use mobile app in the future	BIN1	4.62	.795	0.945	Alalwan et al., 2017
I will always try to use mobile app in my daily life	BIN2	4.64	1.193	0.863	
I plan to use mobile app in future.	BIN3	4.59	1.166	0.843	
Brand Credibility					
Service claims of the brand are believable	BRC1	3.03	.640	0.937	Baek and King (2011)
The brand delivers what it promises	BRC2	3.00	1.071	0.815	
The brand has ability to deliver what it promises	BRC3	3.06	1.066	0.797	
Community Membership					
Participation in farmer organisation/s	CMB1	3.51	1.276	0.973	Lochner 1999, Glynn 1981
Being a member of farmer organisation is like being a member of group of friends	CMB2	3.55	1.575	0.862	
Feel that you belong to the farmer organisation	CMB3	3.50	1.488	0.908	
Interested in knowing what is going on in this community	CMB4	3.51	1.501	0.909	
Perceived Ease of Use					
Learning to operate the mobile app would be easy for me	EOU1	3.95	1.403	0.976	Venkatesh et al., 2003
I would find it easy to get the mobile app do what I want it to do	EOU2	4.01	1.652	0.909	
My interaction with the mobile app system would be clear and understandable	EOU3	3.98	1.629	0.894	
I would find the mobile app system to be flexible to interact with	EOU4	3.84	1.562	0.894	
It would be easy for me to become skillfull at using the mobile app	EOU5	3.98	1.610	0.892	
Facilitating Conditions					
I have the resources necessary to use the mobile app.	FCS1	4.14	1.429	0.973	Adopted from Venkatesh et al., 2003
I have the knowledge necessary to use the mobile app	FCS2	4.17	1.694	0.936	
A specific person (or group) is available for assistance with mobile app difficulties	FCS3	4.18	1.678	0.933	
Hedonic Motivation					
Using mobile app is fun	HMN1	4.00	1.385	0.967	Venkatesh et al., 2012
Using mobile app is enjoyable	HMN2	4.01	1.628	0.939	
Using mobile app is entertaining	HMN3	4.01	1.660	0.916	
Price Value					
I think the mobile app is reasonably priced	PCV1	3.51	1.348	0.972	Venkatesh et al., 2012
I think the mobile app offers value for money	PCV2	3.43	1.598	0.927	
At current price, mobile app provides good value	PCV3	3.53	1.492	0.889	

Dynamic Personalization					
The mobile app provides services that I use very often	PRS1	3.97	1.449	0.979	Adopted from Lee and Lin, 2005 and Wang et al., 2017
The mobile app meets my specific needs	PRS2	4.00	1.697	0.912	
One to one transaction service is provided by mobile app	PRS3	4.00	1.641	0.9	
Customised agri-marketing services are provided	PRS4	3.99	1.675	0.907	
Individualized information regarding offers were provided	PRS5	4.03	1.666	0.899	
Personal Technical Innovativeness					
I like to experiment using technical systems	PTI1	3.84	1.374	0.97	Adopted from Agarwal and Prasad, 1998 ; Patil et al., 2020
Among my peers, I am usually the first to try new work-related technological interventions	PTI2	3.88	1.609	0.911	
If I heard about new relevant technology, I look for ways to experiment with it	PTI3	3.81	1.601	0.909	
In general., I am not hesitant to try out new technology	PTI4	3.79	1.582	0.897	
Relative Advantage					
Using mobile app enables me to accomplish tasks more quickly	RAD1	3.99	1.391	0.973	Moore and Benbasat, 1991
Using mobile app improves quality of work I do	RAD2	3.97	1.585	0.907	
Using mobile app makes it easier to do my job	RAD3	3.97	1.663	0.905	
The disadvantage of using mobile app far outweigh the advantage	RAD4	4.00	1.587	0.889	
Overall, I find using mobile app advantageous in my job	RAD5	4.01	1.574	0.883	
Social Influence					
People who are important to me think that I should use mobile app	SIF1	3.98	1.422	0.968	Venkatesh et al., 2012
People who influence my behaviour think that I should use mobile app	SIF2	3.99	1.673	0.941	
People whose opinions that I value prefer that I use mobile app	SIF3	4.02	1.623	0.918	
Trust					
I believe that mobile app is trustworthy	TRS1	3.91	1.423	0.979	Alalwan et at, 2017
I do not doubt the honesty of mobile app	TRS2	3.93	1.602	0.902	
I feel assured that legal and technological structures adequately protect me from problems on mobile apps	TRS3	3.97	1.659	0.904	
Even if not monitored, I would trust mobile app to do the job right	TRS4	3.86	1.629	0.893	
Mobile app has the ability to fulfil its task	TRS5	3.92	1.668	0.895	

Table 2.4: Validity analysis

	CR	AVE	CMB	PTI	TRS	SIF	PRS	FCS	RAD	EOU	HMN	BIN	PCV	BRC
CMB	0.935	0.784	0.886											
PTI	0.943	0.807	0.156	0.898										
TRS	0.951	0.796	0.066	-0.004	0.892									
SIF	0.941	0.842	0.355	0.106	-0.07	0.918								
PRS	0.955	0.811	0.046	-0.053	0.004	-0.01	0.9							
FCS	0.942	0.844	0.035	0.057	0.043	-0.014	0.038	0.919						
RAD	0.951	0.797	0.142	0.015	0.001	0	0.055	-0.047	0.893					
EOU	0.951	0.797	0.036	0.057	0.045	0.045	0.056	0.024	0.04	0.893				
HMN	0.939	0.838	-0.015	-0.008	0.002	0.03	-0.07	-0.078	-0.006	0.015	0.915			
BIN	0.863	0.682	0.165	0.244	0.216	0.274	0.287	0.242	0.202	0.269	0.231	0.826		
PCV	0.922	0.799	0.357	0.129	0.099	0.115	0.053	0.049	0.337	0.091	-0.008	0.2	0.894	
BRC	0.828	0.626	0.301	0.352	0.282	0.317	0.312	0.306	0.274	0.321	0.269	0.768	0.331	0.791

Diagonal values: Square root of average variance extracted (AVE); Non diagonal values: inter-correlation of the constructs (CMB: community membership; TRS: trust; PTI: personal technical innovation, PRS: dynamic personalization; SIF: social influence; FCS: facilitating conditions; BIN: behavioral intention; HMN: hedonic motivation; RAD: relative advantage; EOU: ease of use; PCV: price value;; BRC: brand credibility

Table 2.5: HTMT analysis

	BIN	BRC	CMB	EOU	FCS	HMN	PCV	PRS	PTI	RAD	SIF	TRS
BIN												
BRC	0.772											
CMB	0.148	0.296										
EOU	0.288	0.347	0.049									
FCS	0.269	0.287	0.033	0.043								
HMN	0.216	0.286	0.032	0.021	0.06							
PCV	0.198	0.332	0.381	0.082	0.06	0.028						
PRS	0.301	0.324	0.038	0.065	0.059	0.068	0.041					
PTI	0.233	0.415	0.124	0.069	0.054	0.017	0.141	0.066				
RAD	0.226	0.289	0.13	0.053	0.04	0.044	0.36	0.055	0.026			
SIF	0.268	0.315	0.362	0.039	0.031	0.038	0.092	0.019	0.099	0.025		
TRS	0.245	0.303	0.069	0.041	0.055	0.013	0.1	0.02	0.027	0.032	0.06	

(Discriminant validity threshold values: 0.850 (strict) and 0.900 (liberal)

2.5.4 Structural model analysis

Structural model analysis was performed and following outcome was observed: CMIN/df= 1.092, TLI = 0.996, CFI = 0.997, SRMR = 0.0398, RMSEA = 0.014. Results of hypothesis testing revealed that personal technical innovativeness, dynamic personalization, perceived ease of use, facilitating conditions, hedonic motivation, relative advantage, trust and social influence have significant positive influence on farmers' behavioural intention to use mobile apps. The results are presented in Table 2.6. Hence the proposed hypothesis – H1, H2, H3, H4, H5, H6, H7 and H8 stands supported. The model explains 51.95 % variance in behavioral intention of the farmers to adopt mobile application for agri-marketing.

Table 2.6: Results of hypothesis testing

Path	Hypo-thesis	Estimate	se	LLCI	ULCI	Support
BIN ← Dynamic Personalization	H1	0.288	.031	.228	.346	Yes***
BIN ← Trust	H2	0.218	.035	.143	.283	Yes***
BIN ← Personal Technical Innovativeness	H3	0.210	.033	.137	.272	Yes***
BIN ← Relative Advantage	H4	0.189	.035	.127	.273	Yes***
BIN ← Perceived Ease of Use	H5	0.208	.034	.131	.279	Yes***
BIN ← Social Influence	H6	0.251	.036	.174	.318	Yes***
BIN ← Facilitating Conditions	H7	0.241	.031	.182	.306	Yes***
BIN ← Hedonic Motivation	H8	0.261	.031	.195	.322	Yes***

*(***p<.001)*

2.5.5 Mediation analysis

To study the mediation effect of brand credibility on the relationship of behavioral intention to use agri marketing mobile app, with its proposed drivers, we used Model 4 in the PROCESS macro with 5000 bootstrapping samples to generate 95% confidence interval. The results showed that the brand credibility fully mediated adoption intention in its relationship with hedonic motivation, dynamic personalization, and personal technical innovativeness. The mediation of brand credibility was found partial in the case of trust, facilitating condition, perceived ease of use, relative advantage, and social influence. Hence the hypotheses H9a, H9b, H9c, H9d, H9e, H9f, H9g and H9h were supported. The direct and indirect effect between the study constructs is presented in Table 2.7.

Table 2.7: Mediation analysis: Direct and Indirect effects of study constructs

Direct effect				Indirect effect				Conclusion
Relationship	β	P	T	Relationship	β	LL CI	ULCI	(Supported hypothesis)
PRS --> BIN	0.0309	0.0523	1.9451	PRS --> BRC --> BIN	0.0991	0.069	0.1299	Full mediation (H9a)
TRS --> BIN	0.0452	0.0052	2.8069	TRS --> BRC --> BIN	0.0942	0.621	0.1263	Partial mediation (H9b)
PTI --> BIN	0.0165	0.3389	0.9574	PTI --> BRC --> BIN	0.1359	0.1042	0.1674	Full mediation (H9c)
RAD --> BIN	0.0341	0.0393	2.0669	RAD --> BRC --> BIN	0.0921	0.0602	0.1251	Partial mediation (H9d)
EoU --> BIN	0.0407	0.0147	2.4495	EoU --> BRC --> BIN	0.1097	0.0776	0.1425	Partial mediation (H9e)
SIF --> BIN	0.0389	0.0149	2.4441	SIF --> BRC --> BIN	0.095	0.0641	0.1276	Partial mediation(H9f)
FCS --> BIN	0.0576	0.0002	3.7563	FCS --> BRC --> BIN	0.0827	0.1108	0.224	Partial mediation(H9g)
HMN --> BIN	0.0242	0.133	1.505	HMN --> BRC --> BIN	0.089	0.0567	0.1212	Full mediation(H9h)

2.5.6 Moderation analysis

Rural sector generally consists of communities like farmer clubs, progressive farmers' groups or farmer-producer organizations for marketing their produce collectively. Such an association among farmers may influence decision making of fellow farmers. The moderation effect of community membership on the relationship between social influence and behavioral intention was hence studied. Similarly, as rural markets are price-sensitive markets, price value on the relationship between relative advantage and behavioral intention was also studied. This moderation analysis was done using PROCESS 4.2 macro of SPSS with 5000 bootstrap samples and a confidence interval of 95. The results revealed positive moderation in both the aforesaid cases. Hence hypotheses H10 and H11 were also supported (Table 2.8, Fig.2.2 and Fig.2.3).

Table 2.8: Moderation analysis

Path	Hypo-thesis	β	p	LLCI	ULCI	Moderation (R^2 change)
Moderator is community membership (CMB)						
BIN ← SIF		.0944	***	.0506	.1382	
BIN ← Int (SIF X CMB)	H10	.0704	***	.0372	.1037	Yes (3%)
Moderator is price value (PCV)						
BIN ← RAD		.0729	***	.0279	.1179	
BIN ← Int (RAD X PCV)	H11	.0592	***	.0249	.0934	Yes (1.9%)

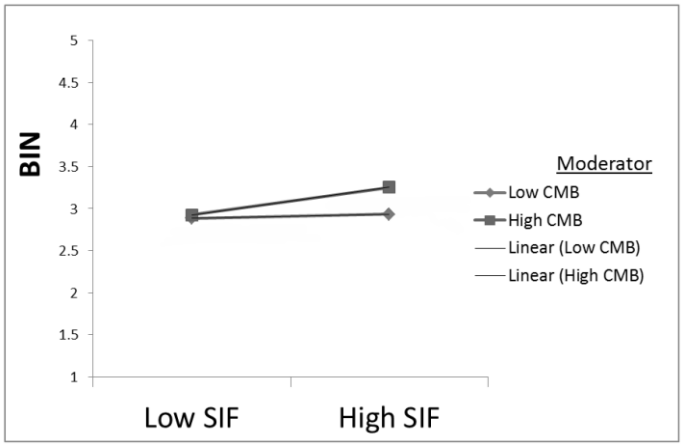


Fig. 2.2 Community membership strengthens the relationship between social influence and behavioral intention

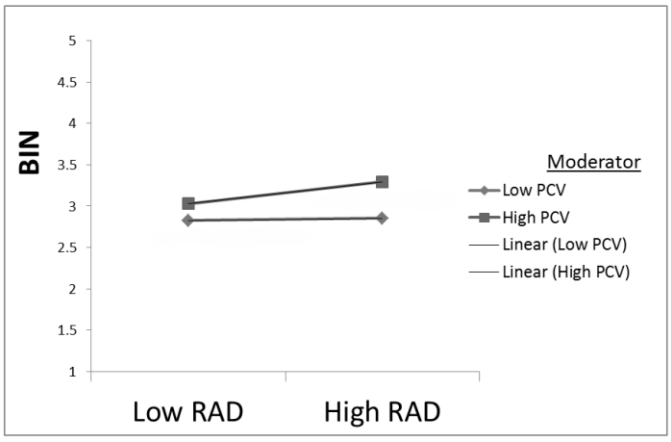


Fig. 2.3 Price value strengthens the relationship between relative advantage and behavioral intention

2.5.7 Control variables

The results demonstrated that the studied socio-demographic variables of age, income, educational qualification and gender do not have any statistically significant effect on the dependent variables. Hence any changes in age, qualification, income or gender do not have a significant influence on brand credibility or behavioral intention to adopt agri-marketing mobile app.

2.6 Discussion

Internet technology has shown rapid advancement in recent years (Chakraborty et al., 2022). Mobile based internet has become an integral part of the ubiquity of digital systems. As discussed earlier, researchers have found its constructive contribution to poverty alleviation and socio-economic benefits. Rural sector and agricultural activities remain critical as rural citizens constitute a majority in emerging markets. Mobile as a medium of communication has increased its penetration in rural markets. However, mobile based applications are yet to benefit and influence the rural sector as it has done to other sectors like finance and banking. This study therefore deep dives into the decision making process of rural users and potential users of agri-marketing mobile app as it needs greater research support.

Gajdosik (2019) posited that artificial intelligence involves iterative autonomous decision-supporting process, leading to personalization which has now become inevitable for value creation. The original UTAUT2 model did not sufficiently embrace this modern technological advancement of artificial intelligence. Hence the determinant of dynamic personalization was proposed and found to significantly influence adoption intention. Similarly trust also had significant positive influence on adoption intention with. Trust is suggested to be of greater importance in situations having lesser experiential judgment (McKnight et al., 2011), as is the case in present context. Moreover, it gains further importance in case of digital resources where face to face human interaction may not happen (Gefen, 2003). Hence it was found

appropriate to present trust as an integral part of the extended UTAUT2 model developed in this study. Brembridge (1986) found that progressive farmers tend to adopt modern technology better than other small farmers. Roger (995) suggested that an individual's personal innovativeness influences their cognitive and decision-making processes. However, there are contradictory findings regarding influence of innovativeness on behavioral intention (Singh et al., 2020). Further, Kabra et al. (2017) criticized the viewpoint taken by researchers regarding definition of personal innovativeness. The current study therefore not only responded to the said criticism and defined personal innovativeness in technological perspective; it also investigates its relationship with adoption intention. Accordingly, the novel viewpoint expressed as personal technical innovativeness significantly influences adoption intention with. Rural sector already has a traditional system of marketing their agri-produce. Hence we argue that users of mobile application would perceive its performance expectancy relative to traditional system and not in isolation. Accordingly, the conceptualization of performance expectancy proposed in original UTAUT2 model was adapted to present context as relative performance expectancy and was found to positively influence adoption intention with. Relationship of effort expectancy with adoption intention was found significant, supporting the recommendations of Rothschild (1975) and extending recommendations of Venkatesh et al. (2012) to the current context. Similarly, social influence, facilitating conditions and hedonic motivation retained from original UTAUT2 model were found significant in the present context also. The factor of habit proposed in the original UTAUT2 model was defined in terms of automatically performed behavior resulting from experience. The current study involved participants who may have negligible experience. Hence the factor of habit was found irrelevant and therefore dropped from the present model. To summarize, the decision of adoption of agri marketing mobile app by rural users in emerging markets is significantly influenced by dynamic personalisation, trust, personal technical

innovativeness, relative performance expectancy, effort expectancy, social influence, facilitating conditions and hedonic motivation.

Further, in the present study we found that brand credibility mediates the relationship of behavioral intention to adopt agri-marketing mobile app with its determinants. Brand credibility provides quality cures, reduces risk related to purchase, diminishes consumer uncertainty and influences user perceptions (Jain et al., 2022). Brand credibility influences quality assessment of the product or service (Molinillo e. al., 2022) and remains important in the present context also. Further, as producers of agriculture-based products associate themselves into social or functional groups for reasons including pooling of crops for bulk sales, representation at social., political or business forums, the study examined its effect on decision making. Accordingly, positive moderation effect of community behavior was established on the relationship between social influence and behavioral intention. Rural sector has an established traditional system of agri-marketing. Farmers would consider the relative benefits of adoption of the modern technology-based system against the traditional system. However, we reason that price value of any benefit cannot be ignored. Hence the influence of price value was studied in the present research. Venkatesh et al. (2012) had proposed price value as a determinant of behavioral intention. Drawing from Zeithmal (1988) price value is viewed in conjunction with performance expectancy and not in isolation. Accordingly, price value was found to positively moderate the relationship between relative performance expectancy and behavioral intention. The study hence provides a comprehensive insight into the behavioral intention of rural citizens to adopt agri-marketing mobile application. The extension of UTAUT2 in this pursuits makes it better suited for investigation of adoption of artificial intelligence enabled advanced digital resources

2.7 Contribution to Theory

Original UTAUT omitted the individual characteristic while conceptualizing the technology adoption model (Dwivedi et al., 2017). Furthermore, UTAUT2 model may not be applicable in every situation as technology acceptance is contextual (Jelinek et al., 2006). This study extends the present understanding of technology adoption in an individual context from a rural agri – marketing perspective that is unique due to socio-economic characteristics (Park, 2009). The present research makes many important theoretical contributions. First, the study proposes the novel construct of ‘Dynamic Personalization’ that is highly relevant in contemporary

times of artificial intelligence based digital resources that result in increased feature dynamics using machine learning tools. The construct captures the importance accorded by users (farmers) in adoption of those m-apps that will include constant changes in the design and interface of offerings as per contemporary requirements. Second, 'trust' was earlier studied mostly as extension to existing research models. Considering its strong relationship with behavioral intention in the present context, the current study incorporates it as an integral part of the model. Third, while supporting the influence of personal innovativeness on an individual's technology-adoption decision-making, some authors have proposed innovativeness as a general cognitive tendency to innovate, while others argue that it is a domain specific individual characteristic (Kabra et al., 2017). Agarwal and Prasad (1998) support the latter view in the context of digital technology. We argue that in the present context of mobile app adoption in rural sector, both the aforesaid view-points relating to PI may not be appropriate, especially with the prevalence of the non-users of digital technology. In the present study we have therefore presented a novel approach to consider individual innovativeness, which neither restricts itself to the specific domain of information technology nor provides the liberty to become unrelated to technology (as is the case in aforesaid 'general cognitive tendency' proposition). We propose personal innovativeness as - the willingness or cognitive tendency of an individual to try out any new technology. Accordingly, we have named the construct as 'personal technical innovativeness'. Fourth, a novel viewpoint is presented for the construct of performance expectancy. Considering that the rural sector already has a traditional system of agri-marketing, any new intervention will be evaluated in the backdrop of existing system. Hence performance expectancy is adapted as relative performance expectancy. Fifth, the present research proposes a new set of moderators in the form of community membership and price value that may have a profound contemporary relevance in explaining the relationship between the drivers such as social influence and relative performance expectancy of m-apps adoption and behavioral intent to adopt by the farming community. Farmers are increasingly recognizing the benefits of community membership which is resulting in incorporation of Farmer Producer Organizations. Hence the influence of community membership in moderating the said relationship was established. Similarly, the importance of investing in agri m-apps by the farmers and its resultant effect on adoption was captured by establishing the moderation of price value on the relationship between relative performance expectancy and adoption of agri m-apps. Sixth, the role of brand credibility was recognized in the decision making of rural farmers in the form of a cue for quality evaluation. It was found to mediate the

relationship of intention to adopt the mobile app with all the proposed determinants. Thus, the importance of branding was established for a higher number of adoptions and to differentiate from the competition in the industry, where replications of technical features are relatively easy. Finally, the present research adapted UTAUT2 model aimed at explaining artificial intelligence enabled modern m-app adoption in rural contexts with a focus on agri-marketing and tested for all the original constructs' relevance. Thus, adding to the literature on the UTAUT2 framework in the modern parlance of advanced technological interventions equipped with artificial intelligence.

2.8 Managerial Implications

For technology to be useful and effective, it must be adopted (Alalwan et al., 2018). Hence non-adoption of m-apps would make all development efforts worthless. This study empirically tests the set of factors influencing behavior intention of rural citizens to adopt m-apps for functional use with special emphasis on marketing of their agri-produce. Development of m-apps requires substantial investment of time and money (Gulfraz et al., 2022). A successful m-app is envisaged as a medium to quickly engage masses with the promoting organization/s. It may at times be a crucial base for growth of a corporate agenda or a developmental program in rural areas. The proposed study gives practical insights for developers of m-apps applying which they can develop m-apps having better adoption potential in rural perspective thereby ensuring better returns on their investment and better accomplishment of the program. Even though customer validation is generally practiced in the mechanism of m-app development, most of them are ineffectively designed, hence failing to suitably integrate multiple dimensions of agricultural landscape (Inwood et al., 2018) and they struggle to scale up (FAO, 2015). The outcome of this study may assist to increase the functional utility of developers' work. Further it will enable ICT to contribute through m-apps by co-creating value with users at a time when growth of mobile based transactions is experiencing down-the-line penetration in India (Rana et al., 2023). The outcome of the study presents eight determinants of behavioral intention. Accordingly, for better

adoption its product, the managerial stakeholder may ensure that the feature of personalization is dynamic and not static. Further, even though the mobile application is for functional use, it should sufficiently generate hedonic motivation. It should have security and privacy features to generate user trust. The interface should be user friendly and designed for minimal cognitive efforts. The task deliverance should ensure relative benefit to the user, compared to existing system of agri-marketing. The study further draws attention of the promoters of the agri marketing app towards brand credibility and its critical influence on decision making of the potential users of the mobile app. Moderation effect of price value sensitizes the manager to keep the pricing competitive even if the performance of the m-app is good. Moderation effect of community membership reveals a promising marketing avenue. The mobile application may be promoted at community platforms along with making the provision of facilitating conditions for better response

Finally, this work lays the basis for development of information systems, including m-apps, through non-intrusive personalization. It is equally useful in cases where data is not available in advance or is not preferred to be collected by intrusion, which generally happens by keeping a watch on usage activities and raising ethical issues. It will further help the development of localized or locally relevant m-apps to solve specific needs of a crop zone or a farming area through advanced digital resources enriched with artificial intelligence.

2.9 Conclusion

This study is an attempt towards inclusive service design to make the socio-economic benefits of digital proliferation reach rural sector through mobile based digital transformation of agri-marketing. The outcome of the study revealed eight determining factors namely personal technical innovativeness, dynamic personalization, perceived ease of use, facilitating conditions, hedonic motivation, relative advantage, trust, and social influence and two moderating factors namely community membership and price value which significantly influence farmers' adoption of mobile based agri-marketing app. Further, brand credibility was found to mediate the

relationship of above said all eight determining factors with intention to adopt agri-marketing mobile app. An integrated model was hence proposed accordingly. The results supported the hypotheses and the model explained 51.95 % variance in farmers' behavioral intention to adopt the agri-marketing mobile app. The outcome enhances the understanding of decision-making behavior of rural potential users of agri-marketing mobile app. It provides practical insights to firms engaged in design and marketing of agri-marketing mobile applications.

2.10 Limitations and future scope

While the study has been taken up based on good representative data gathered from practicing farmers, the study may have some limitations. First, the study was conducted in India and similar studies across culturally different geographies may be taken up for better generalization. Second, the study focuses on emerging markets. The case of developed markets may be different from the present case. Hence further study is required to study the factors that influence behavioral intention to use agri-marketing mobile app in rural sector of developed markets. Third, there are several agro-climatic zones globally. The present sample was taken from one agro-climatic zone. Although the marketing preferences of farmers may not vary with the type of crop and climate, future researchers may take up similar studies to see if the preferences vary with change in agro-climatic zones. Finally, part of the data was collected during covid times. It is difficult to assess if the short-term effect of covid related situations could have influenced the choices of the participants.

Chapter 3
Antecedents and Consequences of Psychological Empowerment of Users of Agri-Marketing Mobile Applications

3.1 Introduction

Power is one of the fundamental concepts in social science (Emmet, 2017). Moreover, it is the root construct of empowerment (Thomas and Velthouse, 1990) and a foremost contributor to the development outcomes (Narayan, 2005). Conger and Kanungo (1988) posit that the need for power at an individual level gets satisfied when they believe that they are adequately able to cope with the events and situations they confront. Empowerment therefore may be seen as a motivational construct implying - to enable the individuals (Conger and Kanungo, 1988). Empowerment at an individual level is essentially psychological empowerment (Zimmerman, 1995). Psychological empowerment promotes healthy usage of its source in the context of online products and services (Wei et al., 2023). Information systems are a powerful tool for empowerment (Wei et al., 2023) albeit mere access of information is insufficient (Zhou et a., 2022). Empowerment is about imparting expertise to an individual, enabling to make their own and better decisions (Eade and Bartlett, 2008), beyond just adopting recommendations (Friis-Hansen and Duveskog, 2012).

Information technology is a medium of capability enhancement and consequently enables empowerment at an individual level (Coeckelbergh, 2011). Synergy of mobile terminals and internet technology is spreading worldwide in almost all sectors with a potential to significantly impact a person's consumption (Zhong and Chen, 2023) resulting in technological innovations and rapid expansion of mobile applications (Gupta and Dey, 2023). App Annie (2023) reported a supporting data that 255 billion mobile applications have been downloaded globally, involving a consumer expenditure of USD 120 billion, largely fueled by the emerging markets. Information and communication technology (ICT) solutions, especially in emerging markets are many a times promoted on assumptions about its developmental role without ground reality substantiations. Consequently, these ICT solutions may even disempower the user depending on target population and context (Ullah, 2017). Studies related to psychological empowerment and digital

competencies are scarce (Pacheco and Montecel, 2023). Psychological empowerment influences socio-economic development (Akkoyunlu et al., 2010) while mobile applications based technological solutions can significantly serve rural market (FAO, 2013). Thomas et al. (2022) has emphasised on the need to ensure that the mobile apps are beneficial to the target user group and are designed as 'empowering apps', meaning, that the apps should have an empowering effect on the user. Surprisingly, researchers in the past have overlooked investigating the psychological empowerment impact of mobile applications on its users and its consequences on the adoption, diffusion, and continuance intention of mobile applications (Mishra et al., 2023; Nguyen et al., 2021; Ambalov, 2018). With a special reference to emerging markets, Zhou et al. (2022) posits that providing access to digital resources is not sufficient for well-being of the user, thus, understanding how the mobile applications can empower the users is important. However, discussion on the issue of user-empowerment has been rarely discussed in prior research (Zhou et al., 2022).

The purpose of current research is therefore to examine the psychological empowerment of the users of mobile applications due to usage of these mobile applications. We draw on the empowerment approach for proposing and empirically testing a framework on psychological empowerment centered around the users of mobile applications. Following recommendations of Pacheco and Montecel (2023) and Bachouche and Sabri (2019) we operationalize the psychological empowerment construct as per the dimensions of meaning, competence, self-determination and impact. As per the requirements suggested by Akhavannasab et al. (2018), our proposed framework includes antecedents and consequences of psychological empowerment caused using mobile applications. Further, we study the mediating role of psychological empowerment on the relationship between its antecedents and consequences.

As the domain of the current study is a digital resource in the form of mobile application, majority of the conditions (antecedents) of psychological empowerment proposed in the study are related to the use of the digital technology and its compatibility with the desired tasks of the user. A digitally literate person can adequately use the digital resource and accordingly draw benefits out of it (Ng, 2012). Hence, considering the relevance and importance of digital literacy in the present context, the moderating role of digital literacy on the relationship between psychological empowerment and its antecedents is also investigated.

Accordingly, the research questions explored in the present study are:

RQ 1: What are the antecedents of psychological empowerment for mobile application(s) users?

RQ 2: What are the consequences of psychological empowerment for mobile application(s) users?

RQ 3: Does psychological empowerment mediate the relationship between its antecedents and consequences?

RQ 4: Does digital literacy moderate the relationship between psychological empowerment and its digital-technology-centric antecedents?

In the sections that follow, we discuss the theoretical background and develop the hypotheses. We follow it up by describing the data collection, analysis and results. In the final sections, we discuss the theoretical contributions along with practical implications, conclusion, and directions for future research.

3.2 Theoretical Background

3.2.1 Psychological Empowerment

The 'empowerment' construct dates itself in 1960s, finding meaning in management, education, sociology, psychology, social work and religion. Its references under various studies can be subsumed in three categories – 'sharing power', 'human welfare and development' and 'increasing productivity' (Bartunek and Spreitzer, 2006). It became a widely used concept in organizational science in 1980s but without any consensus on its definition (Thomas and Velthouse, 1990) until Conger and Kanungo (1988) recommended empowerment to be defined as a motivational process using arguments of Bandura's (1977) feeling of self-efficacy. Thomas and Velthouse (1990) built upon the propositions of Conger and Kanungo (1988) and proposed a cognitive model that operationalized empowerment in terms of intrinsic work motivation involving positively valued experiences derived directly by individuals from a given task. They portrayed empowerment in terms of four related dimensions: meaningfulness, competence, impact, and choice. Zimmerman (1995) argued that at individual level, empowerment is expressed as psychological empowerment which is differentially present among individuals. It may be further described in terms of sense of competence, desire for and willingness to act in

public domain. Spretizer (1995) refined empowerment literature and proposed psychological empowerment in terms of four dimensions-Meaning, referring to a fit between individuals' functional role, beliefs and behaviours (Hackman and Oldham, 1980); Competence, drawn from self-efficacy (Bandura, 1989); Self-determination, referring to sense of autonomy or choice over work behaviour (Deci et al, 1989) and Impact, referring to degree of influence over work outcomes (Ashforth, 1989). It was further argued that missing any one of these dimensions would mean a limitation on experience of empowerment. With some conceptual ambiguity (Lincoln et al., 2002), empowerment has been used in sociology (Simon, 1994), political science (Redley and Weinberg, 2007), psychology (Bachouche and Sabri, 2019) and management (Wathieu et al., 2002). Zimmerman (2000) described empowerment as a theory and suggested that it includes process as well as outcomes of empowerment, which are specific to context and population. The author argued that the empowering process attempts to make available resources, attempts to get greater control and critical understanding of the social environment, making the individuals skillful and decision makers. Empowering at individual level which is essentially psychological empowerment can be achieved by applying cognitive skills through participation in work-related decision-making activities. At the individual level, the theory suggests 'learning decision-making skills',' Managing resources' and working with others as empowering processes with 'sense of control', 'critical awareness', 'participatory behaviours' as its outcomes respectively. Empowered outcomes refer to operationalization of the construct to measure the consequences of the attempts or the effects of the designed interventions. Some documentation on how technology has positively impacted individuals' empowerment in fields such as healthcare, entrepreneurship, tourism and marketing has been done by researchers over last decade, yet impact of digital technology on user psychological empowerment is not sufficiently investigated (Pacheco and Montecel, 2023). Measuring psychological empowerment would enable researcher to distinguish and explore its antecedents and consequences (Akhavannasab et al., 2018). Accordingly, this study measures the psychological empowerment outcome induced by utilitarian mobile application, using the aforesaid four-dimension model proposed by Spreitzer (1995). Developing from this theoretical backdrop, the current study has been taken up to develop and propose a framework on psychological empowerment of the user of mobile application, that includes its antecedents and consequences for new insights having applications in consumer empowerment, social inclusion and meaningful contribution of digital resources. Not only the relationship of psychological empowerment with its antecedents and consequences empirically established, the mediating role

of psychological empowerment between the relationship of its antecedents and consequences is established.

3.2.2 Mobile applications and consumer behavior

Accelerated spread of digital technology has drifted consumer behaviour towards technology-influenced behaviour (Guthrie et al., 2021). Mobile based digital technology has emerged with its transformational impact on humanity (Miladinovic and Hong, 2016) with instantaneous features including access and information sharing regardless of temporal or spatial limitations (Tong et al, 2020). This spread and ease of communication found application with user functions in various domains such as shopping (Gupta and Arora, 2017), learning (Pindeh et al., 2016), banking (Baptista and Oliveira, 2015), mobile payments (Yeh and Litseng, 2017), organizational transformation (Pacheco and Montecel, 2023), digital servitization (Munch et al., 2022) and stock trading (Gupta and Dey, 2023). The subject hence caught attraction of researchers, more so with the proposition of Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) followed by propositions listed in Table 3.1.

Table 3.1: Models and theories that predominantly followed TRA

Theory / Model	Proposed by:	Year
Diffusion of Innovation theory	Rogers	1983
Theory of Planned Behaviour	Ajzen	1985
Social Cognitive Theory	Bandura	1986
Technology Acceptance Model (TAM)	Davis	1989
PC Utilization model	Thompson	1991
Motivational Model of technology adoption	Davis et at	1992
Unified theory of acceptance and use of technology (UTAUT) (in organizational context)	Venkatesh et al	2003
Unified theory of acceptance and use of technology (UTAUT2) (in individual context)	Venkatesh et al	2012

As mobile based digital resources stretched towards consumers with increased penetration, research also extended to individual context (Tamilmani, Rana and Dwivedi, 2020). It further recognized the modern technological advancement such as artificial intelligence (Tong et al.,

2020) and extent of its effect across societies (Chang et al., 2022). Moving forward from exploring adoption and diffusion of technology, researchers adapted and extended theories to study continuance intention of sustained usage of various sub-domains of digital technology, more so since the proposition of expectation-confirmation model by Bhattacharjee (2001). It still remains a topic of increasing interest in research field with satisfaction and perceived usefulness identified as salient determinants of continuance intention (Yan et al., 2021). Some researchers have supported the influence of unconscious factors like habit on continuance intention (Ashraf et al., 2021). The study of mobile app continuance intention has been taken up in the context of food delivery (Zanetta et al., 2021), digital payments (Santosa et al., 2021), e-learning (Jin et al., 2021 and e-wallet (Muchardie et al., 2021). In their attraction towards the investigation of adoption and continuance of digital resources including mobile applications, researchers missed looking into a very important angle of research namely, empowerment of the users of the mobile applications (Pacheco and Montecel, 2023; Bachouche and Sabri, 2019; Akhavannasab et al., 2018) that is reflected as psychological empowerment in individual context (Zimmerman, 1995). Some researchers who touched into the psychological empowerment in digital domain, resorted to a narrow approach of investigating a single dimension of empowerment or remain confined to investigate the empowerment influence of a particular characteristic of the product/service like empowerment due to a health monitoring feature of a mobile app (Dhiman et al., 2019). Similarly, potential empowerment with information and communication technology was explored in the context of agribusiness (Tijani et al., 2017), skill development (Grimshaw and Kala, 2011) and digital competency and job performance (Pacheco and Montecel, 2023). However, they failed to give a comprehensive, generalizable structure providing insight into what constitutes a mobile app leading to psychological empowerment of its user. Further, even after acknowledging that internet based technologies are a potential source of empowerment, it is important to study the conditions that lead to psychological empowerment (Bachouche and Sabri, 2019) in the form of antecedents (Park et al., 2021) and consequences that may be reflected in cognitive or emotional outcomes (Akhavannasab et al., 2018). Drawing from the aforesaid recommendations, the present study, proposes a psychological empowerment model including its antecedents and consequences in the domain of mobile applications. Further, the mediating role of psychological empowerment is studied on the relationship between its antecedents and consequences.

3.3 Hypotheses development and conceptual model

Antecedents of psychological empowerment

3.3.1 Task-technology fit

Task-Technology Fit (TTF) is an important construct for insights relating to technology influenced behaviour (Daradkeh, 2019). In the context of information systems, Goodhue and Thomson (1995) defined TTF in terms of degree of match between capabilities of technology and needs of users' task. It was further asserted that for any digital intervention to impact positively on individual performance, the technology must be a good fit and must be utilized for the task it supports. Fit refers the degree of alignment between features provided by the technology that may be used for the targeted task with that desired task (Goodhue and Thomson, 1995). Vessey (1991) established that a mismatch between tasks and presentation of data related to the task, which is a technology feature, would adversely affect decision-making. Such a support suggesting linkage of performance with cognitive fit was also posited by Jarvenpaa (1989). Positive relationship was established between fit and technology utilization (Cooper and Zmud, 1990) and "System-Work fit" construct was found to be strong predictor of electronic workstation utilization (Floyd, 1988).

The construct of TTF has been applied by researchers in the context of information technology services (Dishaw and Strong, 1999), internet based services (Shang et al., 2007), mobile based insurance services (Lee et al., 2007), mobile banking (Abu-Taieh et al., 2022; Zhou et al., 2010), customer relationship management systems (Kim and Gupta, 2014), blockchain adoption (Taherdoost, 2022), drone adoption (Maghazei et al., 2022), artificial intelligence experience (Hu et al., 2022), online purchasing (kim et al., 2022) and gamification adoption (Mustafa et al., 2022). Literature review reveals that TTF has been extensively applied independently and along with other technology adoption models, mostly to explain adoption of technology. Doll (2010) posited those technical capabilities of a software influence psychological empowerment relating to engineering work. Kim and Gupta (2014) established that perceived fit positively effects user empowerment in organizational work environment. However, a comprehensive investigation of relationship between TTF and psychological empowerment with individual optic is missing in the mobile applications domain. We therefore apply TTF, as the level of correspondence between individual competence, technical functionality and task requirement (Goodhue and Thompson, 1995) and empirically establish its relationship with

psychological empowerment, as an antecedent in the context of mobile applications. Accordingly, we hypothesize that:

H1: Task-technology fit will positively influence the psychological empowerment of users of the mobile application.

3.3.2 Goal congruence

Goals refer to the anticipated benefits pursued by consumers by the use/application of an agency, mobile application in the present case, perceived to possess characteristics that are expected to help them achieve the desired benefits (Hosany, 2012). Outcome-desirability, based on individual goals, is the fundamental cognitive stimuli for assessment of utility of the product/service (Watson and Spence, 2007). Goal congruence is an expression of outcome desirability (Ortony et al., 1988) and motive consistency (Roseman et al., 1990). It determines the directional orientation of experience of usage of a product or service with the goals; evaluated as whether the usage experience draws the users closer towards the desired outcome (Ruth et al., 2002). It is also a strong determinant of emotional response of the user, generating positive influence when goals are related to wellbeing of the user (Ma et al., 2017). In the present context of mobile application, goal congruence has been studied in the context of organizational management control (Kennedy and Widener, 2019), found to influence work-stress and satisfaction in the field of teaching and research (Daumiller and Dresel, 2020) and dominate reward- value (Fromer et al., 2019). In the domain of information technology, goal congruence positively influenced supply chain collaboration in a study investigating potential of blockchain technology (Rejeb et al., 2021). An agency, product or service has a potential to empower the user if it positively influences the desired outcomes and there is a fit with the functional role of the user (Sprietzer, 1995; Zimmerman, 1995). Drawing from these suggestions, we hypothesize that:

H2: Goal congruence *will positively influence the psychological empowerment of users of the mobile application.*

3.3.3 Functional value

Functional value refers to the perceived utility gained from physical or utilitarian performance of an agency of consumption choice (Sheth et al., 1991). Moreover, it is an overall assessment of a product based on the utility perceived to be received (Zeithmal, 1988). It often influences consumer behaviour and is hence recommended to investigate the role of experiential

functional value evaluation in the domain of digital marketing (Lou and Xie, 2020). It was found to positively influence loyalty in case of e-services (Li et al., 2022) and brand equity in banking sector (Loureiro and Sarmento, 2018). Functional value was found to be related with utilitarian aspect of quality of a product or service (Sweeney and Soutar, 2001) and initial trust (Rana et al., 2015).

In the context of mobile applications (mobile app), the variety and functionality of the features of the mobile app that reduce the effort of the user and enhances the usefulness of the mobile app are positively associated with its functional value (Chakraborty et al., 2022). For example, functional value from payments app is derived from features such as use of app without spatial and temporal limits, instant account updates and fund transfers and readily available transaction information (Karjaluoto e al, 2021). Psychological empowerment is also suggested to be related to the level of fitness between functional role of an individual and consumption experience (Thomas and Velthouse, 1990). It is presented as a motivational construct, as an enabler to cope with the situation and functional events (Conger and Kanungo, 1988). Drawing from these suggestions, we hypothesize that:

H3: Functional value *will positively influence the psychological empowerment of users of the mobile application.*

Consequences of psychological empowerment

3.3.4 Emotional value

Emotional value refers to the affective state or feelings generated based on experience of using an agency of consumption choice (Sheth et al., 1991). Feelings that are derived based on the usage of a product/service can have positive or negative alteration influence on the affective state (Yrjola et al., 2019). Emotions may be visualized as devices that operate in a way to predict individual behaviour (Kumare and Shah, 2021). Value perceptions are important constructs in the context of studies relating to online transactions (kim et al., 2017). Researchers have established the role of emotions as determinant of adoption intention including in the context of online transactions (Chakraborty, 2022). In the context of human resource management Zhai et al. (2022) proposed that the systems having psychological empowerment elicit positive emotions resulting in better performance outcomes. Ramos et al. (2014) in the sustainable development context and

Akhvannasab et al. (2018) in marketing research found that empowerment positively influences employee satisfaction. Thomas and Velthouse (1990) proposed a cognitive model and presented empowerment in terms of intrinsic motivation with positively valued experiences derived from the task. An enabling environment, which translates to empowerment (Zimmerman, 1995), drives value co-creation along with satisfaction (Hseih et al, 2022). Further, Akhvannasab et al. (2018) posited that consumer empowerment may results in positive emotional consequences. Drawing from the recommendations of the aforesaid studies, we extend the investigation relating to the consequences of psychological empowerment and hypothesize that:

H4: Psychological empowerment of users of the mobile application will positively influence the emotional value.

3.3.5 Post adoption perceived usefulness

Post adoption perceived usefulness refers to the individuals' belief that the mobile app, primarily due to its certain attributes, can provide performance benefits in accordance with the initially formed expectations (Hossain & Quaddus, 2012). Thong et al. (2006) posits that post adoption perceived usefulness reflects confirming/disconfirming experience. Researchers have applied the construct of perceived usefulness for investigating technology adoption (Gupta and Dey, 2023) and exploring positive affective response (Lee, 2010) including in digital domain, where it was found to develop satisfaction from usage of product/service (Mishra et al.,2023). It has been studied in a variety of digital-technology-based domains including mobile banking (Susanto et al., 2016), desktop services (Huang, 2019), mobile shopping (Shang and Wu, 2017) and mobile payment systems (Gupta et al., 2020). However, Bhattacharjee et al. (2001) proposed perceived usefulness in the digital domain as a post-adoption construct that is positively related as an outcome to confirmation of expectations from the digital resource. Spreitzer (1995) posits that one of the dimensions of psychological empowerment is the fitness of functional role of the individual with the product/service which the individual uses to perform the task. Drawing from these propositions, we apply the post adoption consideration of perceived usefulness to explore it as a consequence of psychological empowerment of the users of mobile applications. Accordingly, we hypothesize that:

H4: Psychological empowerment of users of the mobile application will positively influence the post adoption perceived usefulness.

3.3.6 Mediation role of psychological empowerment

Further to our aforementioned hypotheses proposing relationship of psychological empowerment with its antecedents and consequences, we perform mediation analysis as it has additional benefit in the form of deeper understanding of user behaviour (Chakraborty et al., 2022). Moreover, discussed consequences of PE, namely emotional value and post adoption perceived usefulness, are suggested to be critical factors to build and retain customer base (Alalwan et al., 2018; Bhattacharjee, 2001). Establishment of the mediation role of psychological empowerment will hence provide an insight for developers and promoters of a mobile app and orient them to focus on proposed antecedents of psychological empowerment namely, task-technology fit, goal congruence and functional value for better customer retention. It will also help build a theoretical model comprehensively explaining psychological empowerment of the user of the mobile app. We therefore hypothesize that:

H6a: *Psychological empowerment will mediate the relationship between task-technology fit and emotional value.*

H6b: *Psychological empowerment will mediate the relationship between task-technology fit and perceived post adoption usefulness.*

H6c: *Psychological empowerment will mediate the relationship between goal congruence and emotional value.*

H6d: *Psychological empowerment will mediate the relationship between goal congruence and perceived post adoption usefulness.*

H6e: *Psychological empowerment will mediate the relationship between functional value and emotional value.*

H6f: *Psychological empowerment will mediate the relationship between functional value and perceived post adoption usefulness.*

3.3.7 Moderation effect of digital literacy

Digitally literacy refers to possessing the technical and operational skills to use information and communication technology, mobile applications in the present context, for its use in desired tasks and everyday activities (Ng, 2012). Irrespective of age, digital literacy is the outcome of availability of technology, prior experience, breadth of use, education and self-efficacy (Prensky, 2001). Digital literacy is a broad and evolving concept that can include different type of

literacy such as computer literacy, technology literacy, visual literacy, information and communication literacy, responding to the context and application of digital technology (Pacheco and Montecel, 2023). In the current paper, digital literacy is considered limited to the level of awareness and ability to use basic operations of the mobile phone and mobile application, accessing and understanding online instructions, managing responses and executing commands available through the interface of mobile applications. Digital literacy is gaining research interest and has been studied in various contexts capable of technological interventions such as teaching (Li and Yu, 2022), skills, competencies and social media (Audrin and Audrin, 2022).

Out of the three antecedents of psychological empowerment proposed in the current study, two factors involve technological operations. First is the task-technology fit that refers to a match between capabilities of the technological resource and needs of the user and second is the functional-value referring to the perceived utility drawn from the use of the technological resource (mobile application in this case). A digitally literate individual has leanings different from other individuals and is hence able to operate relevant technologies adequately, including the use of mobile-phone-based technology (Ng, 2012). Hence, we believe that it is important to investigate the role of digital literacy on the relationship of these two antecedents with psychological empowerment. We therefore hypothesize that:

H7: Digital literacy will positively moderate the relationship between task-technology fit and psychological empowerment of the users of the mobile application.

H8: Digital literacy will positively moderate the relationship between functional- value and psychological empowerment of the users of the mobile application.

3.8 Conceptual model

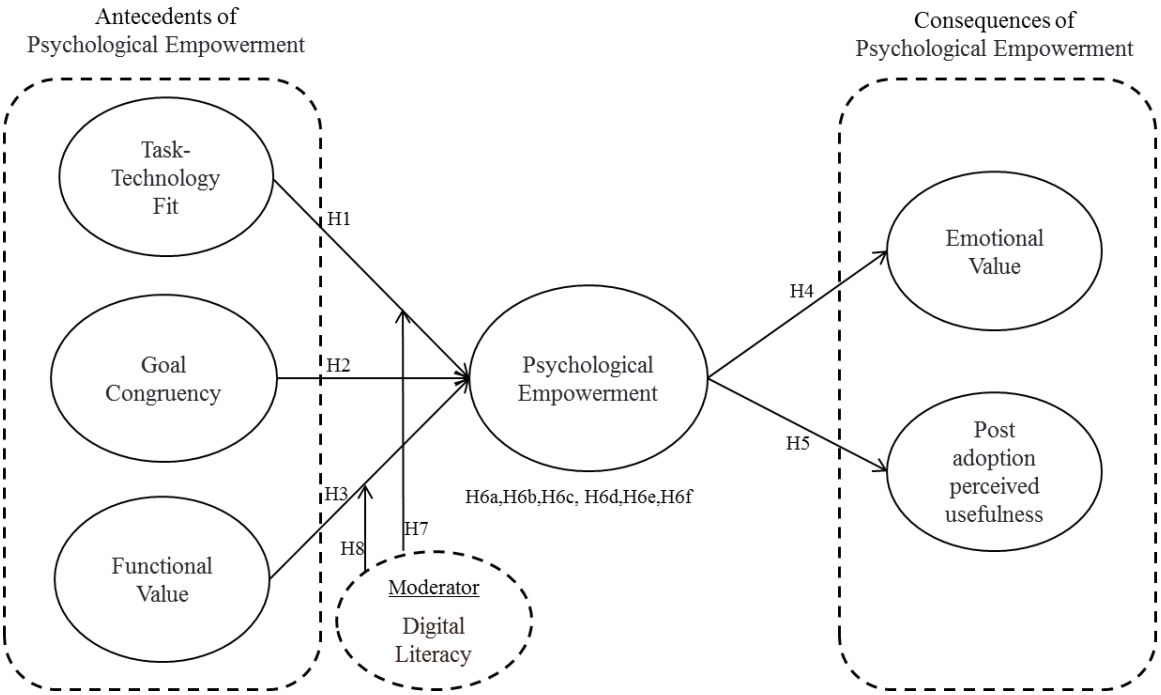


Figure 3.1 Research model

3.4 Methodology

3.4.1 Measures

Measurement of 7 constructs was done using seven-point Likert scale, ranging from, strongly agree to strongly disagree. All the scales were taken from prior studies. The details of scale items along with the source is given in Table 3.4. Accordingly, the questionnaire comprising 31 items was prepared for data collections. Questions related to demographic data including age, gender, income and education level were also asked toward the end of the questionnaire.

3.4.2 Sample and data collection

Rural sector has unique socio-cultural, socio-economic and educational structure (Park, 2009). Mobile applications have not penetrated and influenced consumption and trade in rural sector as compared to other sectors like banking and stock trading (Gupta and Dey, 2023; Baumullar, 2018) even though digital resources have huge potential to empower rural sector (Park, 2009). Hence aiming for further novelty, value addition and output utility for socio-economic development of rural sector, the data was collected from rural areas of trans-Gangetic plains of

northern India, comprising the states of Punjab and Haryana, the leading contributors of foodgrain impacting global supply chain of cereals and pulses (Patel et al., 2022; Mehta et al., 2019; Singh and Sahni, 2019). The respondents were required to have some exposure of using the mobile application for functional use such as agri-marketing. The list of mobile application users was gathered from agri-marketing functionaries of the designated market yards. All these users were randomly selected and personally contacted to obtain their consent to participate in the survey for data collection. The sampling criteria broadly remained same as detailed in chapter 2.

Before the survey, a pilot study was done with 30 participants to validate the questionnaire and look for any improvements in the data collection process (Alalwan et al., 2018) They were requested to go through the questionnaire and present their feedback freely regarding any problem, confusion and clarity of questions. Their feedback was included during design of final questionnaire.

3.4.3 Data analysis

Subsequent to checking and cleansing, 496 valid responses were found, which were then used for data analysis. Table3. 2 details the demographic profile of the respondents. SPSS v 23 and AMOS v 23 were used for two-step data analysis. Structural equation modeling (SEM) technique was applied to test hypothesis and model fit. It was done in two stages – First, by assessment of measurement model and second by evaluation of structural model (Anderson and Gerbing,1982). Composite reliability was used to evaluate construct reliability (Anderson and Gerbing, 1988). Confirmatory factor analysis was performed to assert validity of the research instruments along with analysis of the measurement model (Hair et al., 2010). Common method bias analysis was done in accordance with the suggestions of Harman (1976) and Podsakoff et al. (2003). The PROCESS macro was used to perform mediation and moderation analysis which was further asserted through graphical analysis of the interaction effect.

Table 3.2: Demographic profile

Measure	Category	%
Gender	Male	82
	Female	18
Age (years)	21-40	42
	40-55	50
	55-70	8
Frequency of mobile-app visit	Daily	75
	Weekly	25
Educational Qualification	Post-Graduate	12
	Graduate	60
	Under-graduate	28
Number of Agri mobile app explored	1	5
	2-3	35
	>3	60

3.5 Results

3.5.1 Data normalcy and descriptives

Due to meticulous collection of data with proper involvement with each of the participants there was no case of missing data. Hence, data analysis was initiated with establishing the data normalcy. The Skewness and Kurtosis values were checked and found to be within the tolerance limits of +3 to -3 (Chakroborty et al., 2022) establishing that the data were distributed normally (Hair et al., 2017). This was followed by multicollinearity test. VIF for all independent variables was also within the recommended limit of less than three. Hence the data of 496 valid participants was used for further analysis. The descriptive statistics of the study constructs are presented in Table 3.3.

Table 3.3: Mean, SD and Correlation of study variables

	Mean	SD	TTF	PSE	PAU	DIL	FNV	GCR	EMV
TTF	4.1649	1.33802	1	.638**	.510**	.600**	.544**	.562**	.415**
PSE	4.4651	1.39607	.638**	1	.720**	.675**	.667**	.658**	.672**
PAU	4.3328	1.39092	.510**	.720**	1	.530**	.452**	.466**	.665**
DIL	4.6849	1.50285	.600**	.675**	.530**	1	.593**	.515**	.498**
FNV	4.0994	1.27402	.544**	.667**	.452**	.593**	1	.568**	.447**
GCR	4.1914	1.34696	.562**	.658**	.466**	.515**	.568**	1	.452**
EMV	4.2984	1.39516	.415**	.672**	.665**	.498**	.447**	.452**	1

*(*p<.050; **<.010; ***<.001)*
(TTF: task technology fit, PSE: psychological empowerment, PAU: post adoption perceived usefulness, DIL: digital literacy, FNV: functional value, GCR: goal congruency, EMV: emotional value)

3.5.2 Common method bias

Harman single factor test was initially used to investigate the concern of common method bias. According to the SPSS output, the total variance explained by a single factor was well below the threshold of 50%. However, to further establish that the CMB is not a matter of concern for further progress with data analysis, latent common method factor (Podsakoff et al., 2003) was introduced in the measurement model. After relating the latent common factor to all the items of all the constructs in the model, model fitness was assessed. The change in chi-square against change of one degree of freedom was found to be far less than the critical value of 3.84 at p-value of 0.05. Hence it was safe to conclude that CMB is not a matter of concern in the present study, for further data analysis.

3.5.3 Measurement model analysis

Confirmatory factor analysis was performed to measure reliability, validity and fit indices. All the factor loading were found to be greater than 0.7 (Table 3.4). The items were hence eligible for further analysis. Model fit indices were also within the recommended limits with TLI = .993, cmin/df = 1.284, CFI =.994, SRMR = .0373 and RMSEA = .025 (Tabacknick and Fidell, 2007).

Further, composite reliability (CR) and Average variance explained (AVE) values are presented in table 3.5. CR values for all the constructs were greater than 0.7. AVE was found to be greater than 0.5. Reliability and convergent validity were hence established. Further the square root of AVE was found to be greater than the inter-correlations between constructs (Table 3.5) thereby establishing the discriminant validity was established (Hair et al., 2017; Forner & Larcker, 1981). However, the discriminant validity was further established using heterotrait-monotrait

(HTMT) method. The values are presented in Table 3.6. All the values were within the recommended limit of 0.85, further establishing discriminant validity (Henseler et al., 2015)

Table 3.4: Items and loadings

Construct and Items		Mean	SD	Loadings	Source
Task Technology Fit					
In helping complete my tasks, the functions of mobile app are enough	TTF1	4.18	1.274	0.956	Zhou et al., 2010
In helping complete my tasks, the functions of mobile app are appropriate	TTF2	4.15	1.509	0.964	
In general, the functions of the mobile app fully meet my needs	TTF3	4.17	1.552	0.818	
Goal Congruence					
This mobile app promoter organization's goals give me opportunity to achieve my personal goals	GCR1	4.18	1.313	0.974	Supeli and Creed, 2013; Hosany, 2012
Overall experience was consistent with what I wanted to achieve	GCR2	4.23	1.491	0.918	
Compared with my desires, task performance with mobile app was consistent	GCR3	4.18	1.511	0.853	
I have moved the realization of my goal forward	GCR4	4.18	1.565	0.914	
Functional Value					
I think mobile apps require less effort in comparison to other methods of doing work	FNV1	4.12	1.251	0.975	Chakraborty et al., 2022
I think mobile apps are reliable	FNV2	4.05	1.464	0.896	
I think mobile apps help in quicker performance in comparison to other methods of doing work	FNV3	4.13	1.448	0.88	
I think operating mobile app can be learnt quickly	FNV4	4.12	1.502	0.893	
I think mobile apps are good for my work	FNV5	4.09	1.479	0.877	
Psychological Empowerment					
The work I do is very important to me	PSE1	4.48	1.361	0.968	Soleimani et al., 2021
My job activities using mobile app are personally meaningful to me	PSE2	4.52	1.572	0.802	
I am confident about my ability to do my job	PSE3	4.44	1.555	0.816	
I have mastered the skills necessary for my job	PSE4	4.42	1.596	0.808	
I have significant autonomy in determining how I do my job	PSE5	4.51	1.603	0.827	
I have considerable opportunity for independence and freedom I how I do my job	PSE6	4.44	1.630	0.805	
I have a large impact on what happens in my section of this work activity	PSE7	4.46	1.581	0.814	
Emotional Value					
I feel relaxed while using mobile app	EMV1	4.31	1.369	0.948	Chakraborty et al., 2022
I enjoy using the mobile app	EMV2	4.29	1.562	0.830	
Using mobile app gives me pleasure	EMV3	4.27	1.549	0.824	
Using mobile app is interesting for me	EMV4	4.32	1.600	0.837	
Post Adoption Perceived Usefulness					

The mobile app is an effective mechanism for task performance	PAU1	4.34	1.345	0.963	Gupta et al., 2020
Mobile app provides value through better deal offers	PAU2	4.34	1.595	0.881	
Mobile app saves time	PAU3	4.35	1.550	0.885	
Mobile app saves effort	PAU4	4.31	1.573	0.883	
Digital Literacy					
I am confident with my search and evaluate skills	DIL1	4.67	1.462	0.945	Ng, 2012
I am familiar with mobile application issues such as cyber safety	DIL2	4.65	1.691	0.796	
I know how to solve my own technical issues related to mobile app	DIL3	4.71	1.683	0.861	
I have the technical skills needed for using the mobile app	DIL4	4.71	1.650	0.793	

Table 3.5: Validity analysis

	CR	**AVE**	PAU	GCR	**T**TF	**F**NV	DIL	PSE	EMV
AVE	0.942	0.802	**0.896**						
GCR	0.939	0.794	0.502	**0.891**					
TTF	0.919	0.792	0.551	0.604	**0.890**				
FNV	0.939	0.756	0.491	0.593	0.568	**0.870**			
DIL	0.938	0.793	0.530	0.463	0.610	0.431	**0.890**		
PSE	0.960	0.775	0.741	0.697	0.678	0.698	0.679	**0.881**	
EMV	0.941	0.800	0.692	0.492	0.484	0.484	0.516	0.717	**0.894**

Diagonal values: Square root of average variance extracted (AVE); Non diagonal values: inter-correlation of the constructs
(TTF: task technology fit, PSE: psychological empowerment, PAU: post adoption perceived usefulness, DIL: digital literacy, FNV: functional value, GCR: goal congruencey, EMV: emotional value)

Table 3.6: HTMT analysis

	PAU	**DIL**	**EMV**	**FNV**	**GCR**	**PSE**	**TTF**
PAU							
DIL	0.114						
EMV	0.611	0.136					
FNV	0.673	0.031	0.442				
GCR	0.488	0.072	0.3	0.653			
PSE	0.288	0.165	0.499	0.211	0.088		
TTF	0.286	0.159	0.14	0.434	0.693	0.069	

(Discriminant validity threshold values: 0.850 (strict) and 0.900 (liberal)

3.5.4 Structural model analysis

Structural model analysis was performed for hypotheses testing and to identify the model fit. Following outcome was observed: CMIN/df= 1.284, TLI = 0.993, CFI = 0.994, SRMR = 0.0373, RMSEA = 0.025. Results of hypothesis testing are presented in Table 3.7. The model explains 66 % variance in psychological empowerment of the users for the mobile applications.

Results of hypothesis testing revealed that task-technology fit, goal congruence and functional value have significant positive influence as antecedents, on the psychological empowerment of the users for the mobile applications. Also, emotional value and post adoption perceived useful are positively related to psychological empowerment as its consequences. Accordingly, the proposed hypothesis – H1, H2, H3, H4 and H5 stands supported.

Table 3.7: Results of hypothesis testing

Path	Hypothesis	Estimate	SE	LLCI	ULCI	Support
PsyEmp ← Task technology fit	H1	0.370	.042	.285	.454	Yes***
PsyEmp ← Goal congruence	H2	0.391	.040	.300	.462	Yes***
PsyEmp ← Functional values	H3	0.427	.040	.348	.499	Yes***
Emotional Values ← PsyEmp	H4	0.638	.022	..589	..681	Yes***
Post adoption usefulness ← PsyEmp	H5	0.664	.022	.616	.704	Yes***

*(***p<.001)*

3.5.5 Mediation analysis

To study the mediation effect of psychological empowerment on the relationship between its antecedents and consequences, we used Model 4 in the PROCESS macro with 5000 bootstrapping samples to generate 95% confidence interval. The results revealed that the psychological empowerment fully mediated the relationship between FNV and EMV while it partially mediated the relationships between TTF-EMV, TTF-PAU, GCR-EMV, GCR-PAU,

FNV-PAU. Accordingly, the hypotheses H6a, H6b, H6c, H6d, H6e and H6f were supported. The direct and indirect effect between the study constructs is presented in Table 3.8.

Table 3.8: Mediation analysis: Direct and Indirect effects of study constructs

Direct effect				Indirect effect				Conclusion
Relationship	β	P	T	Relationship	β	LLCI	ULCI	(Supported hypothesis)
TTF → EMV	0.2343	0.0000	6.0244	TTF → PSE → EMV	0.2645	0.2067	0.3220	Partial mediation (H9a)
TTF → PAU	0.2909	0.0000	7.0295	TTF →PSE → PAU	0.3156	0.2610	0.3696	Partial mediation (H9b)
GCR → EMV	0.2003	0.0022	3.0750	GCR →PSE → EMV	0.3088	0.2547	0.3638	Partial mediation (H9c)
GCR → PAU	0.3738	0.0000	5.4378	GCR → PSE → PAU	0.3328	0.2801	0.3876	Partial mediation (H9d)
FNV → EMV	0..0408	0.2374	1.1829	FNV → PSE → EMV	0.2124	0.1654	0.2619	Full mediation (H9e)
FNV → PAU	0.1131	0.0023	3.0712	FNV → PSE → PAU	0.2365	0.1880	0.2859	Partial mediation(H6f)

3.5.6 Moderation analysis

Digital literacy in the present research refers to the basic technical knowledge to use mobile applications and skills to operate it for the desired task. It influences the ability of the user to use the technology adequately (Ng, 2012). Hence to investigate the role of digital literacy in the present context, moderation effect of digital literacy was assessed on the relationship between psychological empowerment and the two technology-centric antecedents, namely task-technology fit and functional value, proposed in this study. The moderation analysis was done using Model 1 of PROCESS 4 macro of SPSS with 5000 bootstrap samples and a confidence interval of 95. The results revealed that digital literacy strengthened the relationship between TTF → PSE and FNV → PSE. Hence hypotheses H7 and H8 were also supported (Table 3.9, Fig.3.2 and Fig.3.3).

Table 3.9: Moderation analysis

Path	Hypo-thesis	β	SE	t	p	LLCI	ULCI	Modera-tion ?
			Moderator: Digital Literacy					
TTF --> PSE	H7	0.064	.0261	2.4339	.0000	.0122	.1149	Yes
FNV --> PSE	H8	0.099	.0287	3.4392	.0006	.0423	.1550	Yes

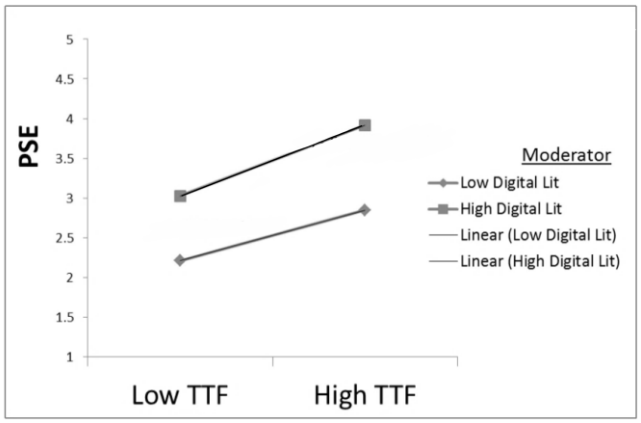


Figure 3.2 Digital literacy strengthens the relationship between task-technology fit and psychological empowerment

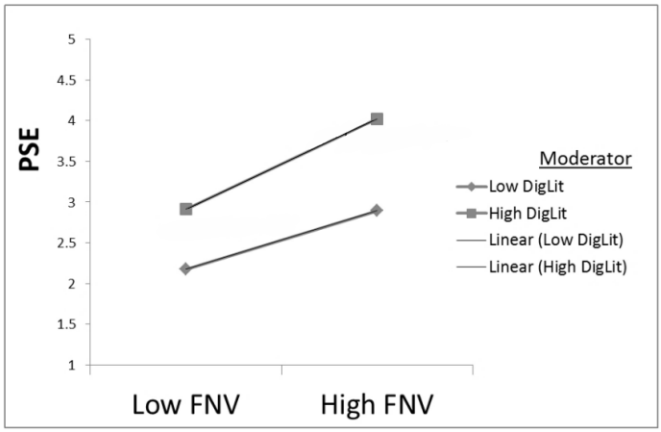


Figure 3.3 Digital literacy strengthens the relationship between functional value and psychological empowerment

3.6 Discussion

The proliferation of mobile applications is impacting consumption in allmost all sectors of humanity (Zhong and Chen, 2023). This has lead to incrased interest of researchers in this domain of digital technology. However, most of the research work during last few decades has remained around adaptation and extention of various technology adoption theories and models to study adoption and continuance intention of users. A pertinent question whether the mobile applications are enabling the user to cope with the events, largely remained unanswered. In its recent researcher, emphaised the need for designing mobile apps that empower its users. Yet the

discussion on empowerment by use of digital resources was found to be rare. The current study was hence taken up to investigate the psychological empowerment impact of mobile applications. Empowerment theory (Zimmerman, 1995) was taken as the theoratical base and the construct was operationalised as per the propositions of Spreitzer (1995) wherein it is suggested that empowerment in the individual context is essentially psychological empowerment and requires the presence of all four dimensions, namely meaning, self determination, competence and impact for an agency/product/service to positively influence psychological empowerment. Accordingly, we proposed a parsimonious yet comprehensively integrated model explaining 66% variance in psychological empowerment and including antecedents and consequences of psychological empowerment of the user of the mobile applications. Daradkeh (2019) recommended investigating task-technology fit while investigating behavioral intention in the domain of technology. Researchers found its influence on use of digital resources for funtions including mobile banking, blockchain technology services, online purchases, and virtual gaming (Abu-Taieh et al., 2022; Taherdoost, 2022; Mustafa et al., 2022). Understanding the importance of task-technology fit, it is proposed as one of the antecedetns for psychological empowerment by use of agri-marketing mobile app. Watson and Spence (2007) supported the motivational approach while suggesting the goal oriented approach for investigation of utilitarian aspect of a product or service. Goal congruence is important to assess directional alignment of technological functionalities and user goals. It wsa studied in the domain of blockchain technology and supply chain management (Rejeb et al., 2021) and found to positively influence usage of the technological resource. Extending the construct to the study of psychological empowerment, it is proposed as an antecedent of psychological empowerment. In the context of mobile applications, the functionality of the features of the mobile app determines its functional value. For example the features that reduce the efforts of the user and enhance its functional usefulness, positively associate with its functional value (Chakraborty et al., 2022). Lou and Xie, (2020) found the influence of functional value functional value in the field of digital marketing. Funtional value positively related to loyalty in the case of e-services (Li et al., 2022). It was therefore proposed as the third antecedents of psychological empowerment in the present study. These three factors combinedly satisfy the requirement of presence the four dimensions of psychological empowerment namely meaning, self-determination, autonomy and impact as proposed in the empowerment theory (Zimmerman, 2000). Experiential outcome of consuming a product or service generates an effective state, operationalised as emotional value (Sheth et al., 1991). In their investigation in the domain of

marketing research, Akhvanasab et al. (218) found satisfaction as an outcome of empowerment. Emotional value is proposed to be an outcome of socio-pscychological generated in response to the usage of a product/service and is found to influence consumption related decision-making (Chakraborty et al., 2022). In sync with these findings, emotional value is proposed as a consequence of psychological empowerment in the present context. Along with emotional value, post adoption perceived usefulness is also proposed as a consequences of the psychological empowerment in this study. Perceived usefulness is considered as post adoption construct as per recommendations of Bhattacharjee (2001). He further suggests it to be an important factor for continuance intention of digital resources. Accordingly, both the consequences studies here are important from theoretical as well as practical angle. The proposed relationships were assessed using structural model analysis. The results established that task-technology fit, goal congruence and functioanl value postively influenced psychological empowerment and psychological empowerment positively influeced emotional value and post adoption perceived usefulness. Out of the proposed three antecedetns, two antecedetns related to use of technology and its compatibility with the desried tasks of the user. It was hence the matter of interest to explore the influence of level of digital litereacy of the user on psychological empowerment. Ng (2012) proposed that the digitally literate individuals can operate the technology adequately. The present study investigated the role of digital litereacy on the relationship between psychological empowerment and the two technology-centric antecedetns, namely task technology fit and functional value. The moderation analysis revealed that digital literacy strenghtened the relationship between psychological empowerment and both these antecedetns. Chakraborty et al. (2022) suggested that mediation analysis has additional benefits as it provides deeper insights into the role of a factor influencing behaior. The current research work accordingly establishes the mediation effect of psychological empowerment on the reltaionship between its antecedents and consquences. The relationships so established are presented as an integrated model, comprehensively explaining the phenomena of psychological empowerment of the user of the mobile app in the context of agri-marketing

3.7 Theoretical implications

This study extends and complements the research on impact of mobile applications on individuals by adopting an empowerment approach instead of the deterministic approach mostly

adopted by researchers to investigate adoption and continuance intention of mobile apps. It transforms the role-relationship of researcher into a social resource. A comprehensive explaination of the phenomena of psychological empowerment of users of mobile applications in the rural context has been provided through empirically established model that explains 66% variance in psychological empowerment with a novel set of antecedents and consequences. Task technology fit, goal congruence and functional value, the three antecedents proposed here, operationalise the four dimensions of psychological empowerment, namely, meaning, self-determination, autonomy and impact posited in the empowerment theory. The consequnces of psychological empowerment, namely, emotional value and post adoption perceived usefulness are suggested to be of great importance for sustainable use of mobile app (Bhattacharjee, 2001), They are found to be positively related to psychological empowerment. Chakraborty et al. (2022) recommended that mediation analysis has additional benefits in the form of deeper insights into the role of a factor. Present study investigates and establishes the mediating role of psychological empowerment on the relationship between its antecedents and consequences. The model presented in this study, hence establishes a pathway to generate the outcome in the form of emotional value and post adoption perceived usefulness. Further, as digitally literate person can adequately use the technology for the desired tasks (Ng, 2012), the study explores the inflouence of digital literacy on the relatonship between psychological empowerment and its technology centric antecedetns. Accordingly, the results establish its moderation effect on the relationship between psychological empowerment and its technology centric antecedets. Hence, a comprehensive insight into the empowering conditions and its outcome has been provided in the domain of mobile applications by presenting an integrated model and empirically establishing the relationships.

3.8 Practical Implications

Mobile applications are many times promoted on the bases of assumptions and optimism without analysing its real impact or potential (Ullah, 2017), resulting in lack of sustained use. The model proposed in the current study provides a basis to focus on factors that lead to users' psychological empowerment which further results in consequences that have been found to positively impact sustained use of mobile app (Bhattacharjee, 2001). Similarly the potential user of the mobile app can identify an empowering mobile app by analysing the task technology fit, goal congruence and functional value of the mobile app. Moreover, as the data has been collected from the rural sector, the output potentially contributes to the socio-economic development of rural citizens by enabling development of an empowering technological resource in the form of mobile application. A consideration of the outcome of this study will guide the designers of the mobile app to have good understanding of the goals, desired utilities and competencies of the target users and to generate a technical correspondance of these goals and competencies with the features and interface of the mobile app, instead of adopting a top down approach. The task technology fit in the present case may indicate that the icons for various operations may be kept graphical as per rural functionality, instead of keeping them geometric. The functional value relationship may indicate the deliverance of marketing deal till the procurement and logistics and not only price discovery. Accordingly, based on the findings it can be inferred that a functionally targetted mobile app can be expected to have better individual and social impact and sustained use instead of a generic mobile app. Moreover, an empowerment approach to intervention design and evaluation redefines the professional's role relationship with the target population and makes him a resource for a community.

3.9 Conclusion

Ubiquity of mobile applications effects consumption and consumer behavior (Lou and Xie, 2020). Researchers have largely remained confined to application of theories and models to investigate adoption and continuance intention of the mobile app without sufficiently looking into its enabling impact. The study fills the research gap by proposing and empirically establishing an integrated model explaining psychological empowerment of users of mobile app along with its antecedents and consequences. Conger and Kanungo (1988) proposed empowerment as a

motivational construct – meaning: 'to enable' to cope with events. The real success of digital solutions lies in their capacity to empower users. Psychological Empowerment (PE) is defined as "a cognitive state characterized by a sense of autonomy, competence, and goal internalization" (Deci & Ryan, 1985). The present study uses these propositions to operationalize the psychological construct and quantitatively establish the relationship between its antecedents and consequences in the context of mobile app. Discussed consequences of PE are suggested to be critical to build and retain customer base (Bhattacharjee, 2001; Alalwan et al, 2018). The results demonstarte that task-technology fit, goal congruence and functional value positively influence PE while PE positvley influences emotional value and post adoption perceived usefulness. The mediation effect of PE on the relationship between its antecedetns and cosequences is also established. The moderating role of digital literacy is also established on the reationship between PE and its antecedetns, motivating the potential users to enhance digital literacy for adequate use of the technology, leading to their enhanced PE. In the process, the outcome makes several recommendations that has multifold theoratical and practical implications. The consideration of these insights can help design and promote an enabling mobile app.

3.10 Limitations and future work

The study is conducted in the northern plains of India. For further generalization, similar studies may be conducted in other cutlurally distinct areas. Similary, developmed coutries may have different socio-demographic and socio-economic setup that may differently influence the output. Hence a separate study may be taken up in developed coutries. The data was collected from rural sector which is opined to have its own social, educational and economic peculiarities. It may hence a matter of interest to investigate psychological empowerment in urban setup where functional needs and user competencies may be different.

Chapter 4
Cognitive Appraisal and Socio-Technical Dimensions as Drivers of Agri-Marketing Mobile-Applications' Continuance Intention

4.1 Introduction

Digital technology based products face a tough challenge of its sustained usage leading to lack of persistent impact or commercial success (Mishra et al., 2023). The data reported by various business-intelligence investigators support this observation. 56% users delete/uninstall mobile app within first week of app download or initial use (Business Line, March 18, 2020). Half of the android mobile apps were deleted within 30 days of initial use (Business of Apps, January 23, 2023). 83% of iphone mobile apps were deleted soon after initial use (Linkdin, January 30, 2016). The reasons of early discontinuation of mobile apps, as per the mentioned reports are, non-friendly interface design, negatively disconfirming user experience, compatibility issues and lack of functional utility. The interest of researchers to explore continuance intention in the domain of digital products and services enhanced with the proposition of expectation-confirmation model (ECM) by Bhattacharjee (2001). In their attempt to study continuance intention in digital technology domain, researchers applied expectation-confirmation model in conjunction with factors such as ease of use, trust, hedonic motivation and attitude (Ambalov, 2021; Dwivedi et al., 2020). The subject is gaining importance as the long-term viability and success of a new information technology based product/service ultimately depends on its continuance (Ambalov, 2018).

Synergy of mobile terminals and internet technology is spreading worldwide with a potential to significantly impact a person's consumption (Zhong and Chen, 2023) in almost all sectors other than agriculture (Manimekalai, 2013). Despite having significant potential to serve rural markets and to benefit small-holder farmers, mobile-based digital technology solutions are struggling to sustain, thereby falling short of their assumed potential (Elbehri & Chestnov, 2021; Baumuller, 2018; FAO, 2013). Digital agriculture, an enabler to transform our food systems to feed the world, needs human-centric research based insights, increasing the likelihood of success

of digital solutions (FAO, 2017). However, Nguyen et al. (2022) suggests that the studies relating to continuance intention are mostly insufficient as they adopt single-approach investigation. Instead, they recommend a dual-approach investigation comprising an unconscious or affective response, and a cautious evaluation, for better understanding of continuance intention in digital domain. However, there is a lack of such dual-approach systematic studies in the present context (Nguyen et al., 2022). It can hence be drawn from the business data, read along with the suggestion of the researchers, that there is evidently a gap in understanding the continuance behaviour, which calls for a dedicated dual-approach research to comprehensively identify factors that influence continuance intention of agri-marketing mobile app (Mishra et al., 2023).

. The present research work comprising three essays, comprehensively investigates the consumer behaviour in the domain of mobile applications, with a focus on their functional use of agri-marketing, in the rural sector of emerging markets. Technology needs to be adopted to explore its potential. Hence, the first essay proposes an empirically established model, consisting of a set of determinants of behavioral intention to adopt mobile apps in the present context. The real success of technological resource lays in its beneficial impact and enabling capabilities. The second essay therefore investigates the phenomena of psychological empowerment of users of the mobile app and proposes a model including conditions (antecedents) and consequences of psychological empowerment. The identified consequences are suggested to be of utmost importance for sustained usage behaviour in the context of digital resources (Bhattacharjee, 2001). Finally, this third essay is taken up responding to the need of a comprehensive investigation of continuance intention and understanding its importance for the persistence impact and commercial success of mobile apps. Drawing from the recommendations of Nguyen et al. (2022), the present work comprise of a set of two studies adopting dual approach of investigating continuance intention. Adapting the cognitive appraisal model (CAM) proposed by Johnson and Stewart (2008), Study1 proposes novel dimensions of cognitive appraisal and quantitatively establishes its relationship with emotional reaction and continuance intention. In study 2, drawing from the suggestions of Malodia et al. (2023) and Kiron et al. (2016), we explore digital congruence of people, task and technology for their influence on continuance intention. Hence, a socio-technical system comprising drivers of rational decision-making of sustained use of the mobile app is proposed. Accordingly, we attempt to answer following research questions:

RQ1: a) What are the dimensions of cognitive appraisal of mobile apps in the domain of agri-marketing in the rural sector?

b) Does the emotion of 'satisfaction' mediate the relationship between cognitive appraisal and continuance intention to use the mobile apps for agri-marketing in rural sector?

RQ2: a) What are the elements of a socio-technical system for rational decision making of sustained use of agri-marketing mobile apps in rural sector?

b) Does 'post adoption perceived self-efficacy' mediate the relationship between elements of socio-technical system and continuance intention to use the mobile app for agri-marketing in rural sector?

In the following sections, we discuss the theoretical framework and develop the hypotheses. We follow it up by describing the data collection and analysis. In the final sections we describe the theoretical contributions along with managerial implications, conclusion, and directions for future research.

4.2 Literature review and theoretical background

4.2.1 Mobile app continuance intention

Continuation intention is proposed as a post-adoption situation when the agri-marketing mobile application usage transcends to the consideration of regular use through conscious processing. It refers to the intention of an individual to continue using the technology, the mobile application in the present context (Nabavi et al., 2016). Technology adoption is only the starting point. Its sustainable success can only be assessed in terms of continued use of the technology (Bhattacherjee, 2001). Oliver (1980) proposed expectation confirmation theory (ECT) and suggested that meeting the prior expectations pertaining to the used product/service and its perceived post-adoption performance determines the users' satisfaction and post adoption usage. Researchers have since then, widely adapted ECT to study post adoption behaviour in technology based products/services (Hossain & Quaddus, 2012). Bhattacharjee (2001) extended ECT to information systems domain and proposed expectation confirmation model (ECM). Technology continuance theory combines TAM (Davis, 1989) with ECM and improves upon the explanatory power as compared to TAM (Liao et al., 2009). Further, researchers have studied perceived ease of use, trust, enjoyment and attitude in conjunction with ECM in an attempt to explain continuation behavior in digital domain (Ambalov, 2021; Dwivedi et al., 2020). Nguyen et al. (2022) posits that single- approach study of continuance intention is insufficient. Instead, they suggest a dual approach comprising a cautious evaluation and an unconscious response for better understanding of continuance intention in digital domain. Emotion is a powerful, innate and

principally unconscious process (Sylwester, 2000). Satisfaction, drawn from Bhattacherjee (2001) has been recognized as a salient emotional determinant of continuance intention of digital technology based product/service (Ng et al., 2011). However, there is lack of a systematic study involving aforesaid dual approach of understanding continuance intention (Nguyen et al., 2022). The current study therefore explores the continuation intention of using agri-marketing mobile app in rural sector, through a set of two studies, adopting the dual approach suggested by Nguyen et al. (2022). Study 1 comprises emotional reaction to cognitive appraisal and its effect on continuance intention and study 2 comprise rational assessment of continuance decision through socio-technical system.

4.2.2 Cognitive appraisal

Cognitive appraisal theory was pioneered by Lazarus and Folkman (1984). It proposes that the process of appraisal is triggered by occurrence of an event that automatically generates emotions which initiate expressive and behavioral changes (Roseman and Smith, 2001). Appraisal decouples emotional response from rigid relationship with a situation and adapts emotional responses to external and internal conditions (Lazarus, 1991). Appraisals involve conscious and complex cognitive processing (Roseman and Smith, 2001). They are based on a user's personal relevance and experience (Roseman and Evdokas, 2004). Cognitive appraisal theory has been validated in the context of post-purchase behaviours (Watson and Spence, 2007), tourism (Ma et al., 2016) and psychology (Frijda et al., 1989), among others. Watson and Spence (2007) recommend application of CAT in marketing due to its superiority in explaining antecedents as well as consequences of emotions. However, the investigation of continuance behaviour through arousal of emotion in response to appraisal, requires, firstly the identification of appraisal components suitable in a particular context and secondly the emotion it elicits (Roseman and Smith, 2001). Researchers have differently proposed appraisal components with a variety of emotional constructs, with lack of uniformity and consensus (Wang et al., 2022; Ma et al., 2016; Ellsworth & Smith, 1988). However, satisfaction was found to be most important motivator of individual continuance behaviour (Liao et al., 2009) especially in digital domain (Stone and Baker-Eveleth 2013; Bhattacharjee, 2001). Research on emotions in marketing domain has three approaches referred to as: categories approach, dimensions approach and the cognitive appraisals approach (Watson and Spence, 2007). However, cognitive appraisal approach provides a comprehensive explanation of user behavioral (Johnson and Stewart, 2005). The structural model

of cognitive appraisal helps us to understand how our appraisals of stimuli are used to elicit specific emotions. It allows us to apply the theory of cognitive appraisal to our real life events. In the current study, drawing from the recommendations of Watson and Spence (2007), we adapt cognitive appraisal model (CAM) proposed by Johnson and Stewart (2005) to study cognitive appraisal of agri-marketing mobile app and propose a novel set of components of cognitive appraisal. We retain the appraisal component of goal congruence, goal importance and certainty from the original CAM model. The component of 'agency' proposed in the CAM refers to the entity which is believed to be the central to the experience, and is hence the instrument of appraisal. The agency in our case is fixed as the agri-marketing mobile app. It is hence held constant for empirical study of the proposed model. We argue that CAM missed on giving sufficient consideration to the realization of the goals through the agency. Hence, in sync with the suggestions of Wu et al. (2013); Scherer et al. (2001) and Ma et al. (2016) we propose goal realization as one of the components of cognitive appraisal. Further, Stone and Baker-Eveleth (2013) and Bhattacharjee (2001) posit that confirmation is an important antecedent of satisfaction especially in the context of digital systems. Hence, we propose confirmation also as one of the components of cognitive appraisal. Cognitive appraisal is contextual and increasingly believed to help understand usage behaviour of new age technologies (Wang et al., 2022). We therefore, in study 1, explore the relationship of cognitive appraisal components with the satisfaction as the emotional outcome of the cognitive appraisal, and its effect on continuance intention. 'Appraisal Model of Emotion' (Johnson and Stewart, 2005), is adapted here in the context of agri-marketing mobile app, attempting to have a comprehensive understanding of the continuance behaviour.

4.2.3 Socio-technical system

Technologies and their implications need to be studied in their entirety by including people, process and technology (Zhang and Williamson, 2021). When studying behavioral aspect in implementation of outcome based services of a digital product, it is necessary to consider socio-technical system (Zheng et al., 2019). The current study therefore uses socio-technical theory (Bostrom & Heinen, 1977), the consideration of which may lead to design digital systems having better effectiveness (Sony and Naik, 2020). The theory posits that to build a system, social sub-system as well as technical sub-system is required and both the sub-systems should work together to reach the potential output. The social considerations focus on people and performance measures while technical considerations comprise process and technology (Trist, 1981). Socio-technical

system assumes an open system with effective flow of information across boundaries, which make it further suitable for systems where there is an interaction for various actors such as market functionaries, government and legislative environment, which is also the case in our present study comprising agri-marketing mobile app (Munch et al., 2022; Ng et al., 2011). Moreover, for the developers and promoters of the mobile-app, the sustainable competitive advantage lies in know-how of users, and not the technology alone (Bednar and Welch, 2020) as both systems require to work together in sync for a worthwhile output (Jeyaraj et al., 2022). Socio-technical systems approach has been applied in the study of 'Industry-4.0' which is a recent technological advancement synergizing digital and industrial phenomena (Kumar et al., 2022; Zhang and Williamson, 2021). It was used to study consumer behaviour in the context of s-commerce using constructs including familiarity and experience as social components and s-commerce constructs as technical components (Lin et al., 2019; Adwan, 2019). We extend this approach to digital servitization in the form of agri-marketing mobile app in rural sector and propose a new set of elements of socio-technical system. Further, Bandura (1977) posits that self-efficacy, referring to an individual's belief of possessing skills and resources to successfully perform a task, is another important factor influencing users' behavioral intentions. Aharony (2015) argues that self-efficacy is situation and domain specific. We therefore, in study 2, along with proposing a socio-technical system influencing rational decision making pertaining to continuance of agri-marketing mobile app, study mediation effect of self-efficacy on the relationship between the elements of socio-technical system and continuation intention.

4.3 STUDY 1

Hypotheses Development and Conceptual Model

4.3.1 Components of cognitive appraisal

In the process of proposing components of cognitive appraisal, we draw from the following suggestions of Demir et al. (2009). First, a causal relationship exists between cognitive appraisals and emotions. Second, appraisals are best described in terms of components and not as a single question. Third, proposed set of components should be comprehensive and manageable. Fourth, considering prior work on the subject, appraisal components should take into consideration: motive/goal consistency, confirmation of expectation, agency and certainty. Agency in the present case remains constant that is the agri-marketing mobile app. The suggestions are

incorporated in the proposed set of components of cognitive appraisal detailed in sub-sections that follow.

4.3.2 Goal realization

Goals refer to the abstract benefits that consumers pursue to achieve through consumption of a product/service perceived to have characteristics that may help them achieve those benefits (Hosany, 2012). Goal based outcome desirability is widely accepted as a fundamental cognitive appraisal of stimuli (Watson and Spence, 2007). Lazarus (1991) posits that goal realization is an assessment based on the person-environment relationship while Frijda (1987) suggests it be based on motivational relationship with personal goal and is hence better embraced by marketers (Averill and Moore, 1993). An individual's goals in a particular situation are important determinants of generation of emotional reaction (Johnson and Stewart, 2005). Bagozzi et al. (1999) supports goal oriented approach for studying generation of emotions and suggests goals to be a necessary condition for emotional response. Goal realization is a strong predictor of valence of emotion as an outcome of appraisal of a situation (Ma et al., 2016). The model proposed by Johnson and Stewart (2005) is suggested to be most appropriate cognitive appraisal model for studies relating to marketing discipline (Watson and Spence, 2007). Drawing from the aforesaid suggestions, we base our study of cognitive appraisal and its effect on continuance intention of agri-marketing mobile application on the goal-based approach, wherein elicitation of emotional reaction is influenced by goal-realization related experience. Further, following the suggestions of Watson and Spence (2007) we extend the cognitive appraisal model proposed by Johnson and Stewart (2005) by proposing new set of components of cognitive appraisal of agri-marketing mobile app. Johnson and Stewart (2005) included the components of goal congruence and goal importance in their proposed model, but missed to include goal realization. Goal realization becomes all the more important in agri-marketing domain as the fundamental goal of farmer is to efficiently and productively market his farm produce failing which there may be no motivation to continue using the mobile app which is fundamentally developed for functional use of agri-marketing. Therefore, considering the importance of goal realization as a cognitive appraisal dimension, we hypothesize that:

H1: Goal realization, as a component of cognitive appraisal of agri-marketing mobile app is positively related to the positive emotional response.

4.3.3 Goal Congruence

The dimension of goal congruence determines the directional alignment of goals and experience along with determining whether the of usage of product/service draws the users closer to the desired outcome (Ruth et al., 2002). Goal congruence, which may be expressed as motive consistency (Roseman et al., 1990) or outcome desirability (Ortony et al., 1988), is an antecedent of need satisfaction (Ma et al., 2013). There is a strong consensus among researchers that goal congruence is a strong differentiator of emotional reaction (Ma et al., 2016). However, goal congruency is expected to elicit positive emotions only when the goal is helpful in wellbeing of the user of product/service. Manthiou et al. (2017) posits that appetitive goal congruence is positively related to generation of positive emotions. In the present context of agri-marketing mobile app, the goal of producers (farmers) is to sell their farm output at best price with reasonable transaction cost. Hence, a mobile application that has supporting characteristics like helping farmers to have better market access, reduce information asymmetry, best price discovery, logistics planning and transaction autonomy, will elicit positive emotions as the experience of using such mobile application will move them closer towards their desired goals. We therefore hypothesize that:

H2: Goal congruence, as a component of cognitive appraisal of agri-marketing mobile app is positively related to the positive emotional response.

4.3.4 Goal importance

Goal importance, also sometimes referred to as goal relevance, is the evaluation of the relevance of the usage experience of a product/service for the users' goals (Scherer, 1993; Ellsworth & Smith, 1988). Goal importance is a strong predictor of valence of emotion as an outcome of appraisal of a situation (Ma et al., 2016). Its appraisal influences emotional intensity because of its association with desirability of the outcome (Perugini & Bagozzi, 2001) and users' interest in the process (Ellsworth et al, 1988). Laying this in simple terms means, the valuable goals elicit higher intensity emotional response. Appraisal of intensity, conceptualized here as goal importance, is independent of any other appraisal (Scherer, 1997). Its inclusion as dimension of cognitive appraisal provides a basis of predicting emotional reaction that likely has varying consequences depending on the degree of intensity (Johnson and Stewart, 2005). For example, joy which is an intense stage of happiness is likely to occur when importance of goal is greater and therefore leads to higher motivation towards future behaviour (Johnson and Stewart, 2005). In the

present context of agri-marketing, goal of effectively marketing the farm produce may vary in importance depending on socio-economic dependency of the farmer family on farming activity, quantum of land holding and the type of crop grown by them. We therefore hypothesize that:

H3: Goal importance, as a component of cognitive appraisal of agri-marketing mobile app is positively related to the positive emotional response.

4.3.5 Certainty

Certainty dimension of cognitive appraisal refers to the degree of confidence that the desired outcome will occur by the usage of product/service in the given situation, irrespective of whether the outcome has occurred or not (Johnson and Stewart, 2005). Certainty is appraised in consideration of goal outcomes. Hence it can arise from past experience or knowledge that it is reasonable to expect desired outcome in the given situation (Johnson and Stewart, 2005). Lack of experience or knowledge may therefore lead to uncertainty. The appraisal dimension of 'certainty' is important in determination of positive emotional reaction (Ma et al., 2013). The emotional reaction that is elicited in response to high degree of certainty are the likes of joy, relief and anger, and the likes of hope and anxiety are generated in case of low degree of certainty, also referred to as uncertainty. Foundational information for certainty appraisal is the level of achievement of desired goal or perception of likelihood of obtaining the goal (Bagozzi et al., 1988). Manthiou et al. (2017) found that certainty appraisal distinguishes emotional outcome in the case of known outcomes and uncertain outcomes thereby having positive influence on positive emotions. Tiedens and Linton (2001) in their study relating to information processing found that the subjects better engaged and paid better attention to experts when the level of certainty was high. Similarly, in the present case of agri-marketing mobile app, higher level of certainty of effective marketing of farm produce by the use of mobile app is expected to generate positive emotional response. We therefore hypothesize that:

H4: Certainty, as a component of cognitive appraisal of agri-marketing mobile app is positively related to the positive emotional response.

4.3.6 Confirmation

Consumers form an expectation about a product or service which becomes a basis of their decision to use it. After initial consumption, they develop perceptions pertaining to its performance. This assessment of the perceived performance against their original expectations

determines their degree of confirmation (Bhattacharjee, 2001). Confirmation therefore refers to the validation of basic attribute-expectations of the user of a digital product/service. In sync with this explanation of confirmation, we proposed confirmation as a post-adoption construct in the current study. The consideration of confirmation as post-adoption construct highlights the difference between the behaviors of the user accepting the mobile application versus the behavior to continue using it. Confirmation has a direct positive influence on satisfaction in digital domain and it can be used to study post adoption behavior in information systems (Nguyen et al., 2022; Bhattacharjee, 2001). However, researchers have argued that key factors used in grand theories are inadequate to comprehensively explain behavioral intention and they must be extended to study continuance intention in information systems context, by combining its factor/s with other theoretical base, to better respond to the needs of specific context (Lim, 2018; Hsu et al. 2015; Bhattacharjee and Barfar, 2011). Accordingly, we draw the construct of confirmation from ECM (Bhattacharjee, 2001) and integrate it with cognitive appraisal theory to propose a comprehensive set of cognitive appraisal components explaining mobile app continuance intentions in agri-marketing context. We therefore hypothesize that:

H5: Confirmation, as a component of cognitive appraisal of agri-marketing mobile app is positively related to the positive emotional response.

4.3.7 Mediation effect of Satisfaction

Fulfilment of expectations to the extent that the exceptions remain within the zone of tolerance, generates a satisfactory experience (Parasuraman, 1991). Satisfaction automatically involves expectation of pleasing outcome and is generated when these expectations are met (Ortony et al., 1988). The main differentiation of satisfaction from other positive emotional outcomes like joy and happiness is the component of confirmation of expectations. The construct of satisfaction when studied in relation with confirmation, captures the effect of pre-acceptance perceptions and positively relates satisfaction with their continuance intention in information systems domain (Bhattacharjee, 2001). In the present case of mobile applications, which is a sub-domain of information systems, we therefore propose satisfaction as the emotional reaction of the cognitive appraisal. We further propose it as an antecedent of continuance intention in line with the propositions of Bhattacharjee (2001). This positive relationship of confirmation-satisfaction-purchase intention has been established in the context of e-commerce (Hsu and Lin, 2015). However, Ma et al. (2016) classifies satisfaction into two components – attribute satisfaction and

need satisfaction. They further posit that satisfaction when studied only in response to confirmation, like proposed in ECM, it accounts for only attribute-satisfaction while needs-satisfaction is more likely to be the emotional reaction. Drawing from these suggestions, to have comprehensive insight into the psychological phenomena of continuance behaviour of the user of agri-marketing mobile app, we propose satisfaction as an emotional response to cognitive appraisal wherein confirmation is proposed as one of the components along with other goal oriented components as explained in earlier sections of this article. Rural farmers have unique social and technical characteristics (Park, 2009). The proposed set of cognitive appraisal components reveal the overall satisfaction of the user, including attribute-satisfaction as well as need-satisfaction. We therefore evaluate the relationship of overall satisfaction with continuance intention in the context of agri-marketing mobile app. Further, we study the mediation effect of satisfaction on the relationship between components of cognitive appraisal and continuance intention. Accordingly, we hypothesize that:

H6: Satisfaction, as an emotional response of cognitive appraisal of agri-marketing mobile app is positively related to its continuance intention.

H7a: Satisfaction mediates the relationship between goal realization and continuance intention of agri-marketing mobile app .

H7b: Satisfaction mediates the relationship between goal congruence and continuance intention of agri-marketing mobile app .

H7c: Satisfaction mediates the relationship between goal importance and continuance intention of agri-marketing mobile app .

H7d: Satisfaction mediates the relationship between certainty and continuance intention of agri-marketing mobile app .

H7e: Satisfaction mediates the relationship between confirmation and continuance intention of agri-marketing mobile app .

4.3.8 Conceptual model

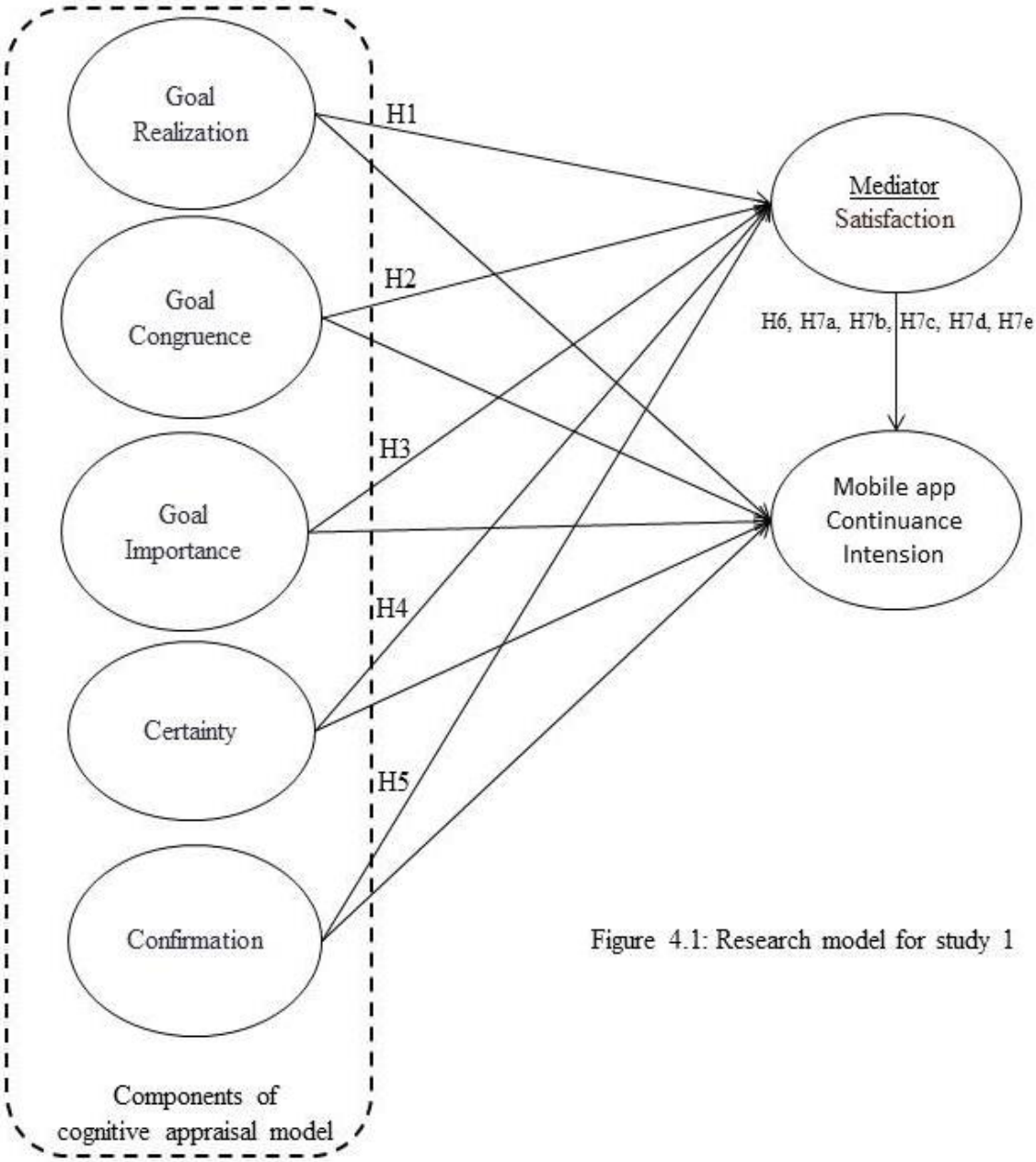


Figure 4.1: Research model for study 1

4.4 Method

4.4.1 Measures

All the scales were adapted from prior studies and seven point Likert scale was used to measure 22 items. The scale to measure goal realization was adapted from Laguna et al. (2023), goal importance scale was taken from Ma et al. (2013), goal congruence and certainty from

Hosany (2012), confirmation and continuance intention from Bhattacharjee (2001) and satisfaction from Nguyen et al. (2022).

4.4.2 Sample and data collection

The focus of this study is on exploring factors that determine behavioral intention of farmers regarding continuation of agri-marketing mobile app after initial use. Hence the target population comprises the farmers of Punjab and Haryana (two states in India that are important from agriculture point of view because they contribute the bulk of cereals to central pool) villages. These farmers were initial users of mobile apps. The farmer list was gathered from concerned agriculture development officers of the Sirsa and Kurukshetra districts of Haryana and Muktsar district of Punjab. From the list obtained, we randomly selected 400 farmers. All these farmers were personally contacted and their consent was obtained to participate in the survey for data collection. Next, these farmers were divided randomly into small groups comprising 5-10 farmers per group. Each group was met separately and after explaining the purpose of the research, the questionnaire was explained in their local language. They were oriented to think of their favourite agri-marketing mobile app which they have used at least once and accordingly answer the questions. The sampling criteria broadly remained same as detailed in chapter 2.

4.4.3 Data analysis

After cleansing and checking, 395 valid responses were found, which were used for data analysis. Table 4.1 details the demographic profile of the respondents. SPSS v 23 and AMOS v 23 were used for two-step data analysis. Structural equation modelling (SEM) analysis was done, first by evaluating measurement model and second, by evaluating structural model as per the suggestions of Anderson and Gerbing (1982). Cronbach's alpha, composite reliability was assessed to establish construct reliability (Anderson and Gerbing, 1988). Confirmatory factor analysis was performed to assess validity of the study instruments and to analyze measurement model (Hair et al., 2010). Common method bias analysis was conducted in accordance with the suggestions of Harman (1976) and Podsakoff et al. (2003).

Table 4.1: Demographic profile of respondents

Measure	Category	%
Gender	Male	90
	Female	10
Age (years)	21-40	45
	40-55	45
	55-70	10
Frequency of Agri mobile app visit	Daily	40
	Weekly	60
Educational Qualification	Post-Graduate	10
	Graduate	60
	Under-graduate	30
Number of Agri mobile app explored	1	20
	2-3	65
	>3	15

4.5 Results

4.5.1 Data normalcy

Careful data collection and one to one interaction with respondents resulted in no case of missing data. Before moving ahead, data normalcy was first established. Values of Skewness as well as Kurtosis were found to be within +3 and -3, which are within tolerance limits (Chakroborty et al., 2022) thereby establishing normal distribution of the data (Hair et al., 2017). Thereafter, multicollinearity test was conducted. VIF was found to be within suggested level of less than three. The data of 395 respondents was hence found good for further analysis. The descriptive statistics of study constructs is presented in Table 4.2.

Table 4.2: Mean, SD and correlation of study constructs

	Mean	SD	GIM	GRZ	GCR	CRT	CTN	SAT	CON
GIM	4.15	1.3282	1	.535**	.522**	.528**	.471**	.663**	.588**
GRZ	4.16	1.3473	.535**	1	.533**	.518**	.470**	.645**	.409**
GCR	4.22	1.3628	.522**	.533**	1	.506**	.463**	.652**	.408**
CRT	4.17	1.3500	.528**	.518**	.506**	1	.426**	.601**	.400**
CTN	4.39	1.3925	.471**	.470**	.463**	.426**	1	.677**	.370**
SAT	4.52	1.4765	.663**	.645**	.652**	.601**	.677**	1	.530**
CON	4.40	1.3452	.588**	.409**	.408**	.400**	.370**	.530**	1

*(**Correlation is significant at 0.01 level)*
(GIM: goal importance; GRZ: goal realization; GCR: goal congruency; CRT: certainty; SAT: satisfaction; CON: confirmation; CTN: continuance intention)

4.5.2 Common method bias (CMB)

Considering the importance of analyzing common method bias, Harman single factor test was applied to analyze common method bias. According to the SPSS output variance explained by a single factor was below the threshold of 50%. However, to further establish that CMB is not a matter of substantial concern, latent common method factor test (Podsakoff et al., 2003) was applied and a latent common factor was introduced in the CFA model. The latent common factor was linked to all items in the model and model fitness was assessed. The change in chi-square was far less than the critical value of 3.84 at p-value of 0.05. Hence it was safely concluded that CMB is not a matter of concern in the present study.

4.5.3 Measurement model analysis

Confirmatory factor analysis was done for measurement of validity, reliability and fit indices. All the factor loading values were found to be greater than 0.7 (Table 4.3) making the items eligible for further analysis. Model fit indices were also found to be within recommended limits as cmin/df = 1.102, TLI = 0.997, CFI = 0.998, RMSEA = 0.016 and SRMR = 0.0224 (Tabacknick and Fidell, 2007).

Further, Table 4.4 presents composite reliability (CR) and Average variance explained (AVE) values. CR values for all the constructs were greater than 0.7. AVE valued were greater than 0.5. Reliability and convergent validity was therefore established. Also, the square root of AVE for all the constructs was greater than the inter-correlations between constructs (Table 4.4). Hence, discriminant validity was established (Hair et al., 2017; Forner & Larcker, 1981). To

further establish discriminant validity heterotrait-monotrait (HTMT) method was applied, the values of which are presented in Table 4.5. All the values were within the strict recommended threshold limit of 0.85 (Henseler et al., 2015)

Table 4.3: Items and loadings

Construct and Items		Mean	SD	Load-ings	Source
Goal realization					
I have succeeded in fulfilling my goal intentions	GRZ1	4.18	1.255	.994	Laguna et al., 2023
I have achieved my goal by using the agri-marketing mobile app	GRZ2	4.18	1.528	.852	
I have moved the realization of my goal forward	GRZ3	4.13	1.541	.851	
Goal importance					
The goal related to agri-marketing matters to me	GIM1	4.18	1.292	.998	Ma et al., 2013
The goal of agri-marketing means a lot to me	GIM2	4.19	1.501	.824	
The goal of agri-marketing is important to me	GIM3	4.06	1.540	.845	
The goal of agri-marketing is relevant to me	GIM4	4.16	1.516	.844	
Goal congruence					
Overall experience was consistent with what I wanted to achieve	GCR1	4.19	1.273	.998	Hosany, 2012
Compared with my desires, agri-marketing with mobile app was consistent	GCR2	4.22	1.543	.858	
I have moved the realization of my goal forward	GCR3	4.24	1.557	.854	
Certainty					
While using the agri-marketing mobile app, I fully understood what was happening around me	CRT1	4.15	1.274	.997	Hosany, 2012; Manthiou et al., 2017
While using the agri-marketing mobile app, I was sure of what was happening	CRT2	4.18	1.517	.840	
I was able to predict what was going on to happen	CRT3	4.18	1.559	.839	
Confirmation					
My experience of using agri-marketing mobile app was better than what I had expected	CON1	4.39	1.254	.997	Bhattacherjee, 2001
The service level provided by the app was better than what I had expected	CON2	4.42	1.526	.858	
Overall, most of my expectations by using agri-marketing mobile app were confirmed	CON3	4.39	1.556	.835	
Satisfaction					
I was satisfied with my decision to use agri-marketing mobile app	SAT1	4.52	1.438	.997	Nguyen et al.,2022
It was good on the whole to use gri-marketing mobile app	SAT2	4.51	1.619	.866	
In general I am satisfied with services of the app	SAT3	4.54	1.659	.863	
Continuance intention					
I intent to continue using the agri-marketing mobile app rather than discontinue its use	CTN1	4.18	1.308	.998	Bhattacherjee, 2001

My intentions are to continue using the agri-marketing mobile app instead of traditional means	CTN2	4.39	1.576	.854
If I could, I would like to discontinue using agri-marketing mobile app (reverse coded)	CTN3	4.38	1.596	.850

Table 4.4: Validity analysis

	CR	AVE	SAT	GRZ	GCR	GIM	CRT	CON	CTN
SAT	0.937	0.834	**0.913**						
GRZ	0.928	0.813	0.671	**0.902**					
GCR	0.932	0.820	0.705	0.585	**0.906**				
GIM	0.931	0.771	0.698	0.602	0.573	**0.878**			
CRT	0.921	0.797	0.666	0.590	0.560	0.601	**0.892**		
CON	0.929	0.814	0.568	0.419	0.442	0.616	0.475	**0.902**	
CTN	0.927	0.811	0.724	0.516	0.505	0.489	0.445	0.395	**0.900**

Diagonal values: Square root of average variance extracted (AVE); Non diagonal values: inter-correlation of the constructs
(GIM: goal importance; GRZ: goal realization; GCR: goal congruency; CRT: certainty; SAT: satisfaction; CON: confirmation; CTN: continuance intention)

Table 4.5: HTMT analysis

	CTN	CRT	CON	GCR	GRZ	GIM	SAT
CTN							
CRT	0.464						
CON	0.404	0.440					
GCR	0.504	0.552	0.445				
GRZ	0.514	0.567	0.445	0.581			
GIM	0.510	0.575	0.638	0.566	0.582		
SAT	0.733	0.653	0.574	0.705	0.697	0.714	

(Discriminant validity threshold values: 0.850 (strict) and 0.900 (liberal)

4.5.4 Structural model analysis

Structural model analysis was performed and following outcome was observed: CMIN/df= 1.072, TLI = 0.985, CFI = 0.988, SRMR = 0.0283, RMSEA = 0.014. Results of hypothesis testing are presented in Table 4.6. The outcome of analysis revealed that all the components of cognitive appraisal model namely goal realization, goal importance, goal congruence, certainty and confirmation are positively related to the emotional response of satisfaction. The model explains 69.9 % variance in 'satisfaction'. Further, the positive influence of satisfaction on continuance

intention was also established in the domain of agri-marketing mobile application. Hence hypotheses H1 to H6 were supported.

Table 4.6: Results of hypothesis testing

Path	Hypo-thesis	Estimate	se	LLCI	ULCI	Support
Satisfaction ← Goal realization	H1	0.207	.042	.123	.279	Yes***
Satisfaction ← Goal congruence	H2	0.304	.044	.220	.396	Yes***
Satisfaction ← Goal importance	H3	0.200	.043	.125	.287	Yes***
Satisfaction Values ← Certainty	H4	0.185	.041	.103	.266	Yes***
Satisfaction ← confirmation	H5	0.132	.044	.058	.248	Yes***
Continuance intention ← Satisfaction	H6	0.741	.026	.703	.779	Yes***

(***p<.001)

4.5.5 Mediating role of satisfaction

To study the mediation effect of satisfaction on the relationship of continuance intention to use agri-marketing mobile app, with the components of proposed cognitive appraisal model, we used Model 4 in the PROCESS macro with 5000 bootstrapping samples to generate 95% confidence interval. The results showed that satisfaction mediated the relationship of continuance intention with all the components of proposed cognitive appraisal model. Hence the hypotheses H7a, H7b, H7c, H7d and H7e were supported. The direct and indirect effect between the study constructs is presented in Table 4.7.

Table 4.7: Mediation analysis: Direct and indirect effects of study constructs

Direct effect				Indirect effect				Conclusion
Relationship	β	P	T	Relationship	β	LL CI	ULCI	(Supported hypothesis)
GRZ --> CTN	0.0601	0.2332	1.1939	GRZ --> SAT --> CTN	0..4123	0.3521	0.4750	Full mediation (H7a)
GCR --> CTN	0.0394	0.4318	0.7869	GCR --> SAT --> CTN	0.4246	0.3646	0.4860	Full mediation (H7b)
GIM --> CTN	0.0415	0.4260	0.7969	GIM --> SAT --> CTN	0.4312	0.36892	0.4975	Full mediation (H7c)
CRT --> CTN	0.0309	0.5205	0.6431	CRT --> SAT --> CTN	0.3960	0.3397	0.4554	Full mediation (H7d)
CON --> CTN	0.0169	0.7098	0.3723	CON --> SAT --> CTN	0.3538	0.2949	0.4155	Full mediation (H7e)

4.6 STUDY 2

Hypotheses Development and Conceptual Model

4.6.1 Elements of socio-technical system

In the present study, drawing from socio-technical theory (Bostrom & Heinen, 1977) we argue that rational decision making regarding continuance behaviour of mobile app is dependent on social as well as technical factors that determine the basis of sustained use of agri-marketing mobile app for functional utility. In this 'Socio-technical system' approach, human centric factors and technology centric factors are interlaced to describe a structure that enables the user to move beyond initial adoption and consider regular use of the mobile app. The factors proposed as elements of socio-technical system for continuance intention of using agri-marketing mobile app are presented in the following sub-sections. Further, Bandura (1977) proposed self-efficacy as an important factor to functionally utilize a technology based product like mobile app. We therefore argue that the elements of socio-technical system should be such that have a positive impact on self-efficacy, which may further impact the continuation intention, positively. We therefore study the relationship of proposed study constructs of socio-technical system with self-efficacy. Further, we empirically explore the mediating role of self-efficacy on the relationship between socio-technical constructs and continuance intention.

4.6.2 Post adoption perceived usefulness

Post adoption perceived usefulness (PAU) represents the users' belief that the mobile app, owing to its certain attributes, will provide performance benefits as per initially formed expectations (Hossain & Quaddus, 2012). Users of a product or service generate positive affective response when the consumption meets their expected usefulness (Lee, 2010). PAU was found to develop satisfaction from usage of product/service based on digital systems (Mishra et al.,2023). Bhattacharjee et al. (2001) proposed perceived usefulness in the digital domain as a post-adoption construct. Thong et al. (2006) posits that post adoption perceived usefulness reflects confirming/disconfirming experience. It has been studied in the similar domains including mobile banking (Susanto et al., 2016), desktop services (Huang, 2019), mobile shopping (Shang and Wu, 2017) and mobile payment systems (Gupta et al, 2020). Post-adoption perceived usefulness of agri-marketing mobile applications can serve as a motivator to pursue expected outcomes as well as freshly defined goals (Karjaluoto et al., 2019). Further, PAU reflects an individual's assimilated belief that the mobile application helps them to effectively execute agri-marketing operations and gain usage related rewards (Gupta et al., 2020). We therefore apply the post adoption consideration of perceived usefulness to explore its influence on self-efficacy with respect to continued usage of agri-marketing mobile application. Accordingly we hypothesize that:

H8: Post adoption perceived usefulness will positively influence self-efficacy in the context of agri-marketing mobile application continuance intention.

4.6.3 Perceived Interface Quality

Perceived interface quality (PIQ) refers to the overall usability of the agri-marketing mobile app driven by its navigational, visual, informational and kinaesthetic design and has primary impact on the user experience and its meaningful outcome for the user (Mishra, 2016; Ku and Chen, 2015; Belanceh et al., 2012). Experts have suggested that the user interface of a mobile application should be user friendly, intuitive, ergonomic, aesthetically pleasing to the effect of reducing cognitive load of the user and enhancing perceived self-efficacy for productive interactions (Liu et al, 2009; Oghuma et al., 2016, Wixom and Todd, 2005). Gupta et al (2020) studied the role of PIQ in the context of mobile payments albeit as an antecedent to self-efficacy yet missed to study its impact on continuation intention through mediation of self-efficacy. In the present case, the interface of mobile application will influence its user-friendliness and navigation of online procedures of agri-marketing. Self-efficacy also refers to the users' belief of his ability to

use the resource striving to achieve desired goals. Therefore, we study the influence of PIQ on self-efficacy with respect to agri-marketing mobile application. Accordingly, we hypothesize that:

H9: Perceived interface quality will positively influence self-efficacy in the context of agri-marketing mobile application continuance intention.

4.6.4 Relative advantage

Relative advantage refers to the users' perceived benefits drawn from the usage of contemporary technology, agri-marketing mobile app in the present case, in comparison to the practice(s) adopted previously for the accomplishments of the desired work (Moore and Benbasat, 1991). Shareef et al. (2012) found a positive influence of relative advantage on behavioral intentions. Relative advantage is suggested to be the most decisive factor in determining adoption of technological innovations in rural sector (Pannell et al., 2006). Its positively influence was found on adoption of broadband adoptions (Hill and Troshani, 2011) and mobile banking (Al-Jabri, 2012). Extending the proposition of Moore and Benbasat (1991) to the current context, we may draw that relative advantage of using mobile application would mean that the user perceives the mobile application usage to be beneficial in comparison to traditional human-intervention based agri-marketing process. We argue that this perception will make the user more confident of his perception about the ability to use the mobile application. Therefore, we propose to extend the study of relative advantage on its impact on continuance intention of usage of agri marketing mobile app in rural sectors, through its impact on self-efficacy. Accordingly, it is hypothesized that:

H10: Relative advantage will positively influence self-efficacy in the context of agri-marketing mobile application continuance intention.

4.6.5 Mediating effect of Self efficacy

Self-efficacy refers to the individuals' belief of possessing the skills and ability required to perform a task successfully (Bandura, 1977). Stadjkovic and Luthans (1998) proposed enactive mastery experience, psychological arousal, vicarious learning and verbal persuasion as determinants of self-efficacy. Self-efficacy belief is influenced by the perceptions of resources that are relevant for the purpose (Bandura, 1977). Thus, perception of higher self-efficacy makes a person more confident of his performing the task well. It therefore is suggested to be an important influencer of individual behaviour (Hu and Meng, 2022). Its positive influence on consumption behaviour has been established in previous studies (Kim et al., 2016, Sujata et al., 2019).

However, Self-efficacy is domain specific, leading to its research in various disciplines (Ahorny, 2015) including psychology (Schunk, 1985), business (Lev, 1997) and medicine (Kear, 2000). In the information systems domain, Compeau and Higgins (1995) defined it as the perceived ability to successfully perform a task using computer/digital systems. It was applied to study the computer usage behaviour (Easley et al., 2003) and adoption of cloud computing (Ahorny, 2015) in the digital domain. We therefore extend the study of self-efficacy to the domain of agri-marketing mobile application and explore its mediating role on the relationship between elements of socio-technical system and continuance intention. We also re-establish the relationship of self-efficacy and continuance intention in the present context. Accordingly, we hypothesize that:

H11: Self-efficacy is positively related to continuance intention of agri-marketing mobile app.

H12a: Self-efficacy mediates the relationship between post adoption perceived usefulness and continuance intention.

H12b: Self-efficacy mediates the relationship between perceived interface quality and continuance intention.

H12c: Self-efficacy mediates the relationship between Relative advantage and continuance intention.

4.6.6 Conceptual model

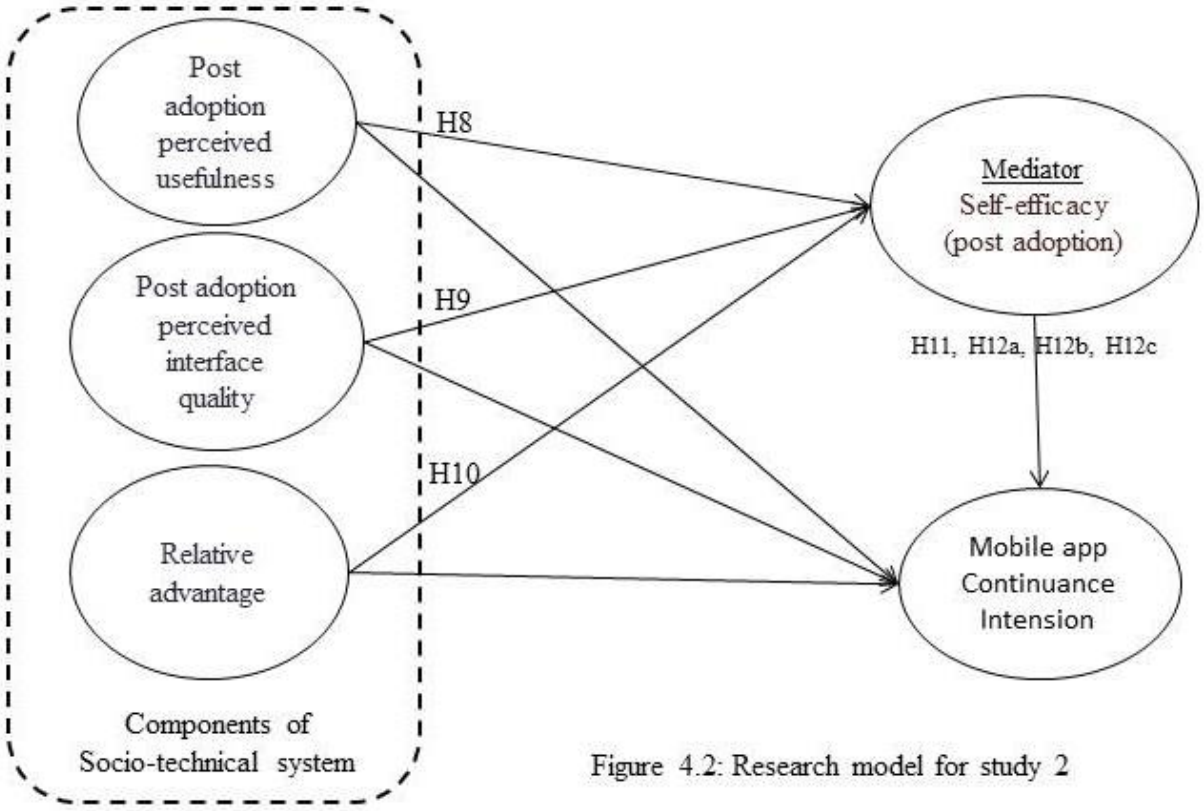


Figure 4.2: Research model for study 2

4.7 Method

4.7.1 Measures

In this research work all the scales were adapted from prior studies and seven point Likert scale was used to measure 17 items. The scale to measure post adoption usefulness, perceived user interface quality and post adoption self-efficacy was adapted from Gupta et al. (2020), relative advantage scale was taken from Moore and Benbasat (1991) and continuance intention from Bhattacharjee (2001).

4.7.2 Sample and data collection

The focus of this study is on exploring factors that determine behavioral intention of farmers regarding continuation of agri-marketing mobile app after initial use. Hence the target population comprises the farmers of Punjab and Haryana (two states in India that are important from agriculture point of view because they contribute the bulk of cereals to central pool) villages.

These farmers were initial users of mobile apps. The farmer list was gathered from concerned agriculture development officers of the Sirsa and Kurukshetra districts of Haryana and Muktsar district of Punjab. From the list obtained, we randomly selected 400 farmers. All these farmers were personally contacted and their consent was obtained to participate in the survey for data collection. Next, these farmers were divided randomly into small random groups comprising 5-10 farmers per group. Each group was met separately and after explaining the purpose of the research, the questionnaire was explained in their local language. They were oriented to think of their favourite agri-marketing mobile app which they have used at least once and accordingly answer the questions. The sampling criteria broadly remained same as detailed in chapter 2.

4.7.3 Data analysis

After cleansing and checking, 371 valid responses were found, which were used for data analysis. Table 4.8 details the demographic profile of the respondents. SPSS v 23 and AMOS v 23 were used for two-step data analysis. Structural equation modelling (SEM) analysis was done, first by evaluating measurement model and second, by evaluating structural model as per the suggestions of Anderson and Gerbing (1982). Cronbach's alpha, composite reliability was assessed to establish construct reliability (Anderson and Gerbing, 1988). Confirmatory factor analysis was performed to assess validity of the study instruments and to analyze measurement model (Hair et al., 2010). Common method bias analysis was conducted in accordance with the suggestions of Harman (1976) and Podsakoff et al. (2003).

Table 4.8: Demographic profile

Measure	Category	%
Gender	Male	85
	Female	15
Age (years)	21-40	40
	40-55	50
	55-70	10
Frequency of Agri mobile app visit	Daily	50
	Weekly	50
Educational Qualification	Post-Graduate	10
	Graduate	65
	Under-graduate	25
Number of Agri mobile app explored	1	10
	2-3	75
	>3	15

4.8 Results

4.8.1 Data normalcy

Careful data collection and one to one interaction with respondents resulted in no case of missing data. Before moving ahead, data normalcy was first established. Values of Skewness as well as Kurtosis were found to be within +3 and -3, which are within tolerance limits (Chakroborty et al., 2022) thereby establishing normal distribution of the data (Hair et al., 2010). Thereafter, multicollinearity test was conducted. VIF was found to be within suggested level of less than three. The data of 371 respondents was hence found good for further analysis. The descriptive statistics of study constructs is presented in Table 4.9

Table 4 9: Mean, SD and Correlation of study variables.

	Mean	SD	RAD	SEF	PAU	CIN	PIQ
RAD	4.226	1.3377	1	.541**	.377**	.430**	.460**
SEF	4.197	1.3582	.541**	1	.559**	.541**	.623**
PAU	4.538	1.2204	.377**	.559**	1	.480**	.547**
CIN	4.395	1.2324	.430**	.541**	.480**	1	.574**
PIQ	4.951	1.378	.460**	.623**	.547**	.574**	1

*(**Correlation is significant at 0.01 level)*
(RAD: relative advantage; SEF: post adoption perceived self-efficacy; PAU: post adoption perceived usefulness; PIQ: post adoption perceived interface quality; CIN: continuance intention)

4.8.2 Common method bias (CMB)

Considering the importance of analyzing common method bias, Harman single factor test was applied to analyze common method bias. According to the SPSS output variance explained by a single factor was below the threshold of 50%. However, to further establish that CMB is not a matter of substantial concern, latent common method factor test (Podsakoff et al., 2003) was applied and a latent common factor was introduced in the CFA model. The latent common factor was linked to all items in the model and model fitness was assessed. The change in chi-square was far less than the critical value of 3.84 at p-value of 0.05. Hence it was safely concluded that CMB is not a matter of concern in the present study.

4.8.3 Measurement model analysis

Confirmatory factor analysis was done for measurement of validity, reliability and fit indices. All the factor loading values were found to be greater than 0.7 (Table 4.10) making the items eligible for further analysis. Model fit indices were also found to be within recommended limits as cmin/df = 1.102, TLI and CFI > .95 and SRMR = 0.0261 (Tabacknick and Fidell, 2007).

Further, Table 4.11 presents composite reliability (CR) and Average variance explained (AVE) values. CR values for all the constructs were greater than 0.7. AVE valued were greater than 0.5. Reliability and convergent validity was therefore established. Also, the square root of AVE for all the constructs was greater than the inter-correlations between constructs (Table 4.11). Hence, discriminant validity was established (Hair et al., 2017; Forner & Larcker, 1981). To further establish discriminant validity heterotrait-monotrait (HTMT) method was applied, the values of which are presented in Table 4.12. All the values were within thes strict recommended threshold limit of 0.85 (Henseler et al., 2015).

Table 4.10: Items and loadings

Construct and Items		Mean	SD	Load -ings	Source
Post adoption usefulness					
The mobile app is an effective mechanism for agri-marketing	PAU1	4.54	1.156	.961	Gupta et al., 2020
Agri-marketing mobile app provides value through better deal offers	PAU2	4.54	1.441	.901	
Agri-marketing mobile app saves time and effort	PAU3	4.53	1.397	.894	
Perceived user interface quality					
Functions of the agri-marketing mobile app are easy to understand	PIQ1	4.95	1.339	.974	Gupta et al., 2020
The information displayed in the mobile app is appropriate	PIQ2	4.94	1.594	.903	
The mobile app provides accurate information and functions that I need for agri-marketing	PIQ3	4.93	1.583	.899	
The visual display and design of the agri-marketing mobile app is good	PIQ4	4.99	1.523	.884	
Relative advantage					
Using mobile app enables me to accomplish tasks more quickly	RAD1	4.22	1.313	.970	Moore & Benbasat, 1991
The disadvantage of using mobile app far outweigh the advantage	RAD2	4.23	1.498	.883	
Using mobile app makes it easier to do my job	RAD3	4.23	1.545	.901	
Using mobile app improves quality of work I do	RAD4	4.22	1.512	.900	
Post adoption self-efficacy					
I have the confidence of using this mobile app for agri marketing	SEF1	4.21	1.284	.967	Gupta et al., 2020
I feel comfortable while using the mobile app for agri marketing	SEF2	4.17	1.573	.917	
I have the capability of using this mobile app for agri marketing	SEF3	4.21	1.510	.921	
Continuance intention					
I intent to continue using the agri-marketing	CIN1	4.43	1.189	.958	Bhattacherj

mobile app rather than discontinue its use				ee, 2001
My intentions are to continue using the agri-marketing mobile app instead of traditional means	CIN2	4.36	1.419	.916
If I could, I would like to discontinue using agri-marketing mobile app (reverse coded)	CIN3	4.40	1.401	.895

Table 4.11: Validity analysis

	CR	AVE	SEF	RAD	PAU	PIQ	CIN
SEF	0.931	0.819	0.905				
RAD	0.936	0.786	0.571	0.887			
PAU	0.913	0.778	0.595	0.392	0.882		
PIQ	0.935	0.782	0.682	0.443	0.595	0.884	
CIN	0.914	0.781	0.587	0.441	0.547	0.641	0.884

Diagonal values: Square root of average variance extracted (AVE); Non diagonal values: inter-correlation of the constructs.
(RAD: relative advantage; SEF: post adoption perceived self-efficacy; PAU: post adoption perceived usefulness; PIQ: post adoption perceived interface quality; CIN: continuance intention)

Table 4.12: HTMT analysis

	CIN	PIQ	SEF	PAU	RAD
CIN					
PIQ	0.627				
SEF	0.593	0.674			
PAU	0.535	0.599	0.614		
RAD	0.468	0.493	0.584	0.412	

(Discriminant validity threshold values: 0.850 (strict) and 0.900 (liberal)

4.8.4 Structural model analysis

Structural model analysis was performed and following outcome was observed: CMIN/df= 1.668, TLI = 0.985, CFI = 0.988, SRMR = 0.0656, RMSEA = 0.042. Results of hypothesis testing are presented in Table 4.13. The outcome of analysis revealed that all the components of socio-technical system namely post adoption perceived usefulness, perceived interface quality and relative advantage are positively related to post adoption perceived self-efficacy. The model explains 60.8 % variance in 'post adoption self-efficacy'. Further, the positive influence of self-efficacy on continuance intention was also established in the domain of agri-marketing mobile application. Hence hypotheses H8 to H11 were supported.

Table 4.13: Results of hypothesis testing

Path	Hypo-thesis	Estimate	se	LLCI	ULCI	Support
Self-efficacy ← post adoption usefulness	H8	0.244	.044	.148	.315	Yes***
Self-efficacy ← post adoption perceived interface quality	H9	0.413	.046	.331	.514	Yes***
Self-efficacy ← relative advantage	H10	0.301	.035	.223	.367	Yes***
Continuance intention ← Self-efficacy	H11	0.611	.036	.545	.686	Yes***

(***p<.001)

4.8.5 Mediating role of self-efficacy

To study the mediation effect of Self-efficacy on the relationship of continuance intention to use agri-marketing mobile app, with the components of socio-technical system, we used Model 4 in the PROCESS macro with 5000 bootstrapping samples to generate 95% confidence interval. The results showed that self-efficacy mediated the relationship of continuance intention with all the components of proposed socio-technical system. Hence the hypotheses H12a, H12b and H12c were also supported. The direct and indirect effect between the study constructs is presented in Table 4.14.

Table 4.14: Mediation analysis: Direct and indirect effects of study constructs

Direct effect				Indirect effect				Conclusion
Relationship	β	P	T	Relationship	β	LL CI	ULCI	(Supported hypothesis)
PAU--> CIN	0..3458	0.0000	7.0681	PAU--> SEF --> **CIN**	0.1987	0.1535	0.2481	Partial mediation (H12a)
PIQ --> CIN	0..4612	0.0000	10.4110	PIQ --> SEF --> **CIN**	0..1498	0.0865	0.2141	Partial mediation (H12b)
RAD --> CIN	0.3417	0.0000	7.0519	RAD --> SEF --> **CIN**	0.2074	0.1529	0.2616	Partial mediation (H12c)

4.9 Discussion

The current set of two studies aims to comprehensively explore the continuance decision making phenomena of initial users of agri-marketing mobile app. The studies are set in the states of Haryana and Punjab as these are the leading producers and contributors of cereals to the national pool. Drawing from the recommendations of Watson and Spence (2007), the first study adapts the 'Appraisal Model of Emotion' (Johnson and Stewart, 2005), in the context of agri-marketing mobile app. It provides a basis for a comprehensive understanding of continuance decision making through integrated consideration of cognitive as well as emotional approach. The study empirically establishes the relationship of the proposed set of components of cognitive appraisal with satisfaction – the emotional response to the cognitive appraisal. The novel set of cognitive appraisal components retains certainty, goal importance and goal congruence from the original model proposed by Johnson and Stewart, 2005 and extends it by proposing goal realization and confirmation of expectations in sync with recommendations of Bhattacharjee (2001) and Gupta et al. (2020). Further, besides establishing positive relationship between satisfaction and continuance intention, mediating role of satisfaction was also studied. Satisfaction was found to fully mediate the relationship between all the components of cognitive appraisal and continuance intention of agri-marketing mobile app. We further argue that because the appraisal and its emotional response can be situation specific, we need to look into the rational decision making aspect of sustained continuance intention. Hence, we took up study 2 based on socio-technical system theory (Bostrom & Heinen, 1977), which posits that comprehensive insight into continuance decision requires consideration of a socio-technical system wherein social as well as technical elements are interlaced. Accordingly, we proposed a set of socio-technical elements comprising of post adoption usefulness, post adoption interface quality and relative advantage. Post adoption usefulness has been suggested to be of great importance for continuance of digital

resource (Bhattacharjee, 2001). Similarly, the importance of interface quality was established in Gupta et al. (2020) albeit its relationship with continuance was not established, which is done in present study. Self-efficacy, suggested to be an important factor in sustained usage of technology based product/service (Bandura, 1977) was proposed as mediator between the socio-technical elements and continuance intention. The data supported all the hypotheses, thereby revealing novel insights in the domain of agri-marketing mobile applications that are expected to have socio-economic benefits in the rural sector and mobile servitization domain.

4.10 Contributions to the theory

The cognitive appraisal model proposed by Johnson and Stewart (2005) had some shortcomings. First, despite taking the goal oriented approach to study emotional elicitation in response to cognitive appraisal, they did not consider goal realization, which is argued to be an important motivator of decision making process, as a dimension of cognitive appraisal even though goal congruence and goal importance were considered. Second, they considered 'agency', referring to the instrument/product/service/entity which is perceived as central to the experience, as variable. This made the model inapplicable to the situation where agency was to be kept as fixed like in the present case where the agency is the agri-marketing mobile application. Third, the model missed on considering the effect of expectations that a user initially forms while adopting attributes based product like mobile app. We therefore, in study 1, adapted the model and introduced goal realization and post adoption confirmation as dimensions of cognitive appraisal while dropping the component of 'agency'. Further, besides empirically establishing the relationships between the study constructs, mediation effect of satisfaction was also studied on the relationship between the proposed cognitive appraisal components and continuance intention. Moreover, the determination of factors leading to a sustainable rational decision was not yet

studied in the digital domain of mobile applications. Social technical theory (Bostrom & Heinen, 1977) interlaces social and technical factors to study its influence on rational decision making. The theory was applied in other technical domains like industry 4.0 and smart manufacturing. We propose a novel set of elements/factors as 'socio-technical system', determining continuance behavior in the domain of agri-marketing mobile app. Further, drawing from Bandura (1977) and responding to the importance of self-efficacy, we propose self-efficacy as mediator of the relationship between elements of socio-technical system and continuance intention.

4.11 Managerial implications

Managerial implications are manifold. Continuance of information systems at the individual user level is also central to the survival or growth of many online based activities. The importance of continuance, vis-a-vis acceptance, is evident from the fact that acquiring new customers may cost as much as five times more than retaining existing ones (Parthasarathy and Bhattacherjee, 1998). Despite the significance of initial acceptance, the long-term viability and success of a new IT product/service are ultimately dependent on its continuance (Ambalov, 2018). The proposed models highlight the critical cognitive, emotional and technological drivers of sustained continuance intention. The study 1 highlights the goal oriented approach integrated with confirmation of expectation from the use of agri-marketing mobile app. Accordingly, the developer of the mobile app needs to ensure that the expectations it has formed through promotion of the mobile app must be delivered through the features and functionality provided in the mobile app so that expectations get confirmed on actual usage. The insights reveal the importance of understanding the goal of the potential user during design of the mobile app and its algorithms. The study 2 highlights the importance of technical features including interface quality leading to self-efficacy so that the user may comfortably and confidently use the mobile for functional utility

resulting in relative advantage compared to traditional practices of agri-marketing. A close consideration of these drivers while developing and marketing the agri-marketing mobile app may lead to better success and impact of the mobile app. The outcome provides a useful framework in explaining individuals' continuance behavior of agri-marketing mobile app from utilitarian as well as emotional perspective.

4.12 Conclusion

The research work provides critical insights for continuation of usage of mobile app for functional utility (agri-marketing) in rural sector. It establishes the factors that help us to understand the decision making process comprehensively by integrating cognitive, emotional and technical aspect. Its practical applications are immense for farmers, rural agri-marketing functionaries, developers and marketers of mobile applications, policy makers, financial and social inclusion functionaries. The outcome on one hand leads the potential users to identify the most appropriate mobile app for their functional utility and on the other hand guides the developers, marketers and policy integrators to invest their funds and efforts focusing on identified factors for better success of the mobile based digital intervention in the form of mobile application in rural sector.

4.13 Limitations and future research work

The study is based on the data gathered from practicing farmers and rural individuals involved in agri-marketing from a particular agro-climatic zone in India. Similar studies across different cultures, agro-climatic zones and geographies may be taken up for better generalization. The situation of developed markets may be different from emerging markets, Hence a separate study may be taken up to explore the factors that influence behavioral intention pertaining to agri-marketing mobile app in developed markets. Moreover, the components of cognitive appraisal and socio-technical system may be extended for adaptation to different circumstances as the times and technologies evolve.

Chapter 5
Conclusion

Digital resources, predominantly in the form of mobile applications, are influencing the way people make choices and consume products and services. However, despite recognition of the potential benefits of mobile applications, researchers have not sufficiently investigated the needs, preferences, compatibility and impact of mobile applications in the rural sector, especially for their highly important function of agri-marketing. Hence their adoption and beneficial influence is less in agri-marketing as compared to other sectors such as banking, finance, and healthcare. The current research work comprising a set of three essays, presented as chapters two, three and four, is aimed at filling this research gap in insights regarding the adoption and continuance of agri-marketing mobile apps and its impact on the psychological empowerment of the users.

The thesis is distributed over five chapters. The first chapter motivates and introduces the research work with structure and research outline. The second chapter extends the 'unified theory of acceptance and use of technology' and adapts it to technological advances in artificial intelligence, to investigate the factors influencing the adoption of agri-marketing mobile applications in the rural sector. Besides, the mediating role of 'brand credibility' and the moderating role of 'price value' and 'community membership' is also studied. The third chapter applies the empowerment theory to investigate the phenomena of psychological empowerment of rural users of agri-marketing mobile apps and proposes a framework including antecedents and consequences of psychological empowerment. The fourth chapter consists of two studies investigating the continuance intention of agri-marketing mobile apps by rural users. The first study proposes a novel set of dimensions of post-adoption cognitive appraisal of agri-marketing mobile apps and establishes their relationship with the emotion of satisfaction, elicited in response to the cognitive appraisal. Further, the mediation effect of satisfaction on the relationship between the dimensions of cognitive appraisal and continuance intention is also studied. Similarly, the second study of chapter four proposes a socio-technical system for rational decision-making regarding the sustained use of mobile apps. The mediating effect of self-efficacy on the relationship between the proposed elements of the socio-technical system and continuance intention is also studied.

The results of this quantitative study provided important insights. Exploring the answer to RQ1 revealed that trust, hedonic motivation, facilitating conditions, perceived ease of use, dynamic personalization, personal technical innovativeness, relative advantage and social influence, have a positive influence on the behavioral intention of the farmers and rural citizens to adopt agri-marketing mobile apps. Further, brand credibility was found to mediate the relationship between behavioral intention and its determinants. Price value positively moderates the relationship between relative advantage and behavioral intention while community membership positively moderates the relationship between social influence and behavioral intention. Investigating RQ2 revealed that task-technology fit, goal congruence and functional value are the conditions (antecedents) for the psychological empowerment of the user of agri-marketing mobile apps. Emotional value and post-adoption perceived usefulness, the two factors suggested to be important for sustained use of any digital resource, are the consequences of psychological empowerment. Digital literacy strengthens the relationship between psychological empowerment and its two technology-oriented antecedents, namely task-technology fit and functional value. Further, psychological empowerment mediates the relationship between its antecedents and consequences. The findings of the investigation of RQ3 supported the goal-oriented approach and established that goal realization, goal congruence, goal importance, certainty and confirmation are the relevant dimensions of the cognitive appraisal of agri-marketing mobile apps and the appraisal elicits the emotional response of 'satisfaction', which is further drives the continuance intention of mobile apps and mediates the relationship between the dimensions of cognitive appraisal and continuance intention. Additionally, post-adoption perceived usefulness, post-adoption perceived interface quality, and relative advantage are socio-technical drivers of continuance intention of the mobile apps for agri-marketing in rural contexts. Self-efficacy mediates the relationship between continuance intention and the elements of the socio-technical system.

5.1 Theoretical contribution

The current research work has many important theoretical contributions. The original unified theory of acceptance and use of technology (UTAUT) omitted the individual characteristic while conceptualizing the technology adoption model (Dwivedi et al., 2017). Furthermore, UTAUT2 model (Venkatesh et al., 2012) may not be applicable in every situation as technology

acceptance is contextual (Jelinek et al., 2006). This study extends the present understanding of technology adoption in an individual context from a rural agri–marketing perspective that is unique due to socio-economic characteristics (Park, 2009). A novel construct of 'Dynamic Personalization' is proposed as a determinant of mobile app adoption. It is highly relevant in the contemporary technological advancement of artificial intelligence. The factors such as trust and perceived ease of use, that were studied previously under different models or extensions are incorporated in the present research since they strongly relate to the adoption of agri-marketing mobile app adoption. Further, responding to the criticism of Kabra et al. (2017) regarding the varied viewpoints of authors for studying the construct of personal innovativeness, a novel definition represented by the construct 'personal technical innovativeness' is proposed. The present research proposes a new set of moderators in the form of community membership and price value that may have a profound contemporary relevance in explaining the relationship between the drivers such as social influence and relative advantage of mobile apps adoption and behavioral intent to adopt the mobile app in rural contexts. Understanding the importance of brand credibility for marketers as well as a cue for quality evaluation, its mediating role was empirically established on the relationship between adoption intention and its determinants. Accordingly, the first essay adapted UTAUT2 model to explain adoption of agri-marketing mobile apps in rural contexts.

The second essay extends and complements the research on the impact of mobile applications on individuals by adopting an empowerment approach. It transforms the relationship of the researcher into a social resource. A comprehensive explanation of the psychological empowerment of users of mobile applications has been provided through an empirically established model that explains 66% variance in psychological empowerment with a novel set of antecedents – task technology fit, goal congruence, and functional value. The consequences of psychological empowerment, namely, emotional value and post-adoption perceived usefulness, suggested to be of great importance for the sustainable use of mobile apps (Bhattacharjee, 2001), are found to be positively related to psychological empowerment. Further, the role of digital literacy has been investigated by studying its moderation effect on the relationship between psychological empowerment and its antecedents. Psychological empowerment is also shown to mediate the relationship between its antecedents and consequences. Hence, a comprehensive insight into the empowering conditions and their outcomes has been provided in the domain of mobile applications for functional use in the rural sector.

The third essay deep dives into the utilitarian as well as emotional aspects of the decision-making regarding sustained usage of mobile apps by rural users. For this, a novel set of relevant cognitive appraisal dimensions and elements of socio-technical systems have been proposed. The cognitive appraisal model proposed by Johnson and Stewart (2005) had some shortcomings. First, despite taking the goal-oriented approach to study emotional elicitation in response to cognitive appraisal, they did not consider goal realization, which is argued to be an important motivator of decision-making process, even though goal congruence and goal importance were considered as dimensions of the cognitive appraisal. Second, they considered 'agency', referring to the instrument/product/service/entity which is perceived as central to the experience, as a variable. This made the model inapplicable to the situation where the agency remained fixed, like in the present case (the agri-marketing mobile application). Third, the model failed to consider the effect of expectations that a user initially forms while adopting an attributes-based product like a mobile app. In the present research, goal realization and post-adoption confirmation are introduced as dimensions of cognitive appraisal while dropping the component of 'agency', to overcome the aforesaid shortcomings. Further, besides empirically establishing the relationships between the study constructs, the mediation effect of satisfaction was also established on the relationship between the proposed cognitive appraisal components and continuance intention.

Moreover, the determination of factors leading to a sustainable rational decision was not yet studied in the digital domain of mobile applications. Social technical theory (Bostrom & Heinen, 1977) interlaces social and technical factors to study their influence on rational decision-making. The theory was applied in other technical domains like industry 4.0 and smart manufacturing. We propose a novel set of elements/factors as a 'socio-technical system', determining continuance behavior in the domain of agri-marketing mobile app. Further, drawing from Bandura (1977) and responding to the importance of self-efficacy, self-efficacy is empirically established as a mediator in the relationship between elements of the socio-technical system and continuance intention.

The study therefore meaningfully adds to the prior theoretical knowledge and provides comprehensive insights into the field of agri-marketing mobile application usage and its empowering impact on rural users.

5.2 Practical Implications

This study contributes towards inclusive service design also, to make the socio-economic benefits of digital proliferation reach the rural sector through mobile-based digital transformation of agri-marketing. The outcome enhances the understanding of the decision-making behavior of rural users and potential users of agri-marketing mobile apps. It provides practical insights to firms engaged in the design and marketing of agri-marketing mobile applications. First essay guides the stakeholders that for better adoption of mobile app they should provide for, and market the product to establish trust and ease of use. The technical capabilities of the mobile should be enabled for dynamic personalization and provide a relative advantage as compared to the existing traditional system of agri-marketing while keeping the price reasonable. Arrangement of facilitating conditions is required for better adoption of mobile apps in rural areas. Even though the mobile app is primarily for functional use, it will be better accepted if it provides hedonic motivation to the user. the Deployment and marketing of products should focus on rural organizations like farmer producer organizations as community membership strengthens the adoption decision. Further, efforts on brand building will be positively rewarded as it has mediating effect on relationship between adoption intention and its determinants.

The second essay provides very important insights into the phenomena of psychological empowerment of the users. Moreover, as it has consequences that have been suggested to be highly important for the sustained use of a digital resource (Bhattacharjee, 2001). Mobile applications are many times promoted on the basis of assumptions and optimism without analyzing their real impact or potential (Ullah, 2017), resulting in a lack of sustained use. The psychological empowerment model proposed in the current study provides a basis to focus on factors that lead to users' psychological empowerment which further results in consequences that have been found to positively impact continuance of mobile app. Similarly the potential user of the mobile app can identify an empowering mobile app by analyzing the task technology fit, goal congruence and functional value of the mobile app. Moreover, as the data has been collected from the rural sector, the output potentially contributes to the socio-economic development of rural citizens by enabling the development of an empowering technological resource in the form of the mobile application. A consideration of the outcome of this study will motivate the designers of the mobile app to have a good understanding of the goals, desired utilities, and competencies of the target users so as to generate a technical correspondence of these goals and competencies with the

features and interface of the mobile app, instead of adopting a top-down or a push-based approach. Accordingly, based on the findings it can be inferred that a functionally targeted mobile app can be expected to have a beneficial individual and socio-economic impact leading to sustained use, instead of a generic mobile app. Moreover, an empowerment approach to intervention design and evaluation redefines the professional's role relationship with the target population and makes him a resource for a community.

Essay three further adds to the practical implications. Continuance of information systems at the individual user level is also central to the survival or growth of many online-based activities. The importance of continuance, vis-a-vis acceptance, is evident from the fact that acquiring new customers may cost as much as five times more than retaining existing ones (Parthasarathy and Bhattacherjee, 1998). Despite the significance of initial acceptance, the long-term viability and success of a new IT product/service are ultimately dependent on its continuance (Ambalov, 2018). The proposed models highlight the critical cognitive, emotional and technological drivers of continuance intention. Study 1 of this essay establishes the importance of a goal-oriented approach while designing a digital resource, in a way, that leads to the confirmation of expectations of the users, from the use of the digital resource. The insights reveal the importance of understanding the goal of the potential user during the design of the mobile app, especially interface and functional attributes. Study 2 establishes the importance of several technical features. First is the interface quality and its further influences on the perception of post-adoption self-efficacy. A user-friendly interface leads to the perception of self-efficacy, meaning, the user may comfortably and confidently use the mobile app. Finally, for the rational decision of sustained usage, the user of the agri-marketing mobile app should experience the functional relative advantage compared to the traditional practices of agri-marketing.

A close consideration of these recommendations while developing and marketing the agri-marketing mobile app may lead to better success and impact of the mobile app. The outcome provides a useful framework for the beneficial impact of agri-marketing mobile apps and explains individuals' adoption and continuance intention of agri-marketing mobile apps from utilitarian as well as emotional perspectives. Stakeholders of mobile apps and agri-marketing will be able to utilize their efforts and financial and non-financial resources in the right direction leading to better success at the right cost. The outcome of this research work will hence pave the way for better contribution of digital resources in the socio-economic development of the rural sector and will be of use to rural users of mobile apps, government agencies, policy-makers, financial institutions,

social functionaries, developers of mobile apps, marketers and field functionaries in the rural areas.

5.3 Limitations and future research

While the study has been taken up based on good representative data gathered from practicing farmers and rural citizens, the study may have some limitations. First, the study was conducted in India and similar studies across culturally different geographies may be taken up for better generalization. Second, the study focuses on emerging markets. The case of developed markets may be different from the present case. Hence further study is required to study the factors that influence behavioral intention to use agri-marketing mobile apps in the rural sector of developed markets. Third, there are several agro-climatic zones globally. The present sample was taken from one agro-climatic zone. Although the marketing preferences of farmers may not vary with the type of crop and climate, it may be interesting to see if the preferences vary with changes in agro-climatic zones. Moreover, the components of cognitive appraisal and socio-technical systems may be adapted or extended for different circumstances as the times and technologies evolve.

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Chapter 4

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Chapter 5

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