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1. Introduction

Despite growth in global ICT adoption and use, direct ownership of information and communication technologies (ICTs) and direct use of e-government by citizens in developing countries (Wilson & Heeks, 2000) remain constrained by lack of text and technology literacy, nonnumeracy (Sambasivan, Cutrell, Toyama, & Nardi, 2010), prevailing inequities in socioeconomic attainment, and cultural and gender disparities (Sahay & Avgerou, 2002). The delivery of ICT-enabled government services requires participation by human intermediaries—citizens, cooperatives, community-based organizations, and businesses that deliver goods and services to citizens on behalf of the government (Janssen & Klievink, 2008; Wilson & Heeks, 2000).

Intermediaries facilitate physical access to e-government infrastructure (Madon & Sahay, 2002; Sein, 2011) and coordinate information access and service delivery for citizens (Sein & Furuholt, 2012; Weerakkody, El-Haddadeh, Al-Sobhi, Shareef, & Dwivedi, 2013). E-government research has emphasized the key role intermediaries play in facilitating ICT access and use (Madon & Sahay, 2002), influencing citizens' adoption and use of e-government (Al-Sobhi, Weerakkody, & Al-Busaidy, 2010), and enabling civic participation (Madon, 2000) by fostering trust among citizens toward e-government (Sein, 2011).

The locally situated and embedded nature of intermediary roles has also been highlighted (Madon & Sahay, 2002). Intermediaries often complement their status as primary ICT users by providing "offline" services to secondary beneficiary-users in the community (Madon & Sahay, 2002; Sein & Furuholt, 2012). Ethnographic studies of microlevel interactions between ICT intermediaries and their beneficiary-users provide rich descriptions of how intermediation requires administrative and political support for the development and reproduction of local relations grounded in reciprocity and trust (Kumar & Best, 2006; Sambasivan et al., 2010).

Whereas a sizable literature has examined the design (Kuriyan, Toyama, & Ray, 2006), sustainability (Kumar & Best, 2006), and outcomes (Madon, 2002) of intermediate configurations such as information kiosks and telecenters from the perspectives of beneficiary-users and institutions (Bhatnagar & Singh, 2010), few studies

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Table 1. Abbreviations.

AVE	Average Variance Extracted
BI	Behavioral Intention
EE	Effort Expectancy
FC	Facilitating Conditions
FPS	Fair Price Shop
IS	Information Systems
PDS	Public Distribution System
PLS	Partial Least Squares
PLS-MGA	PLS Multigroup Analysis
PLS-SEM	PLS Structural Equation Modeling
PE	Performance Expectancy
POS	Point-of-Sale
SI	Social Influence
TAM	Technology Acceptance Model
UB	Usage Behavior
UTAUT	Unified Theory of Acceptance and Use of Technology

(Best & Kumar, 2008; Cecchini & Raina, 2004) have examined the demographic attributes, technology attitudes, and contextual factors that influence technology adoption and use by intermediaries.

The dearth of knowledge about the technology preferences of intermediaries (Weerakkody et al., 2013) is exacerbated by the fact that adoption of e-government by such actors often occurs in mandatory settings, contexts that remain understudied in the ICT and development (ICTD) literature (Rana, Williams, & Dwivedi, 2013b). We extend the study of intermediation to government-mandated interactions between intermediary-users and technology. We ask how ICTs are perceived by key intermediaries responsible for the transfer of food from producers to consumers in the public distribution system (PDS) of Chhattisgarh, India. See table 1 for a list of abbreviations.

The introduction of ICTs in Chhattisgarh's PDS yields a new category of brick-and-mortar intermediaries who must use government-mandated technology to provide non-informational services, such as physical goods, in addition to addressing the information needs of citizens. India's PDS is its largest social welfare program, providing food access to more than 600 million citizens through a nationwide network of 400,000-plus fair price shops (FPSs). FPSs are the fulcra for operational inefficiencies and pilferage, accounting for 40% of food "leaked" from the PDS (Drèze & Khera, 2010). Our study is situated in Chhattisgarh, a state often cited as an example of the gains made possible in operational efficiency and transparency through computerization of commodity procurement and distribution (Drèze & Sen, 2013). Specifically, we study FPS salespersons' satisfaction with the mandatory adoption of a system of point-of-sale (POS) machines and smartcards that generate real-time electronic data on FPS operations.

Fair price shop salespersons are a key intermediary category of e-government users, providing food access to beneficiary households in the "last mile" of the subsidized transfer of food from government warehouses. Such shops are critical sites where households may lose their right to food. With India's government and judiciary viewing ICT-enabled devices as a scalable solution for the problem of food access (Krishnamurthy, Pathania, & Tandon 2014), salespersons' satisfaction (or lack thereof) with POS machines bears significant practical implications for the long-term sustainability of ICT-based interventions in Chhattisgarh's PDS. The success and expansion of such initiatives are more probable when salespersons using POS machines express satisfaction with their experiences.

Following in the contemporary tradition of transfer and diffusion research (Avgerou, 2010), we examine the socio-organizational context in which mandatory adoption of POS machines occurs. In Section 2 we expand on

our rationale for studying salesperson satisfaction. Section 3 introduces our theoretical framework, the Unified Theory of Acceptance and Use of Technology (UTAUT). Section 4 presents our research model with hypotheses regarding factors that influence salesperson satisfaction. Section 5 contains a discussion of instrument development, sampling, data collection, and analyses. In Section 6 we discuss results from our analysis of direct and indirect effects. Our analyses suggest that, more than training by and support from the government, salespersons value the opinions of family members, friends, and peers. Salespersons' perceptions of a technology's usefulness and ease of use influence their satisfaction with technology. Furthermore, in contrast to traditional stereotypes regarding the relationships among technology adoption, age, and education, older, less educated salespersons were more likely than their younger, more educated counterparts to attribute greater satisfaction with POS machines to reputational gains and ease of use.

2. Rationale for Studying FPS Salespersons as Intermediaries

Across the ICTD and e-government literatures, intermediaries are primarily conceptualized as *infomediaries,* third parties who provide access to and facilitate informational use of technology by beneficiaries. Salespersons are intermediaries whose responsibilities transcend provision of information access and include transferring goods from government to citizens. Below, we identify specific motivations for studying technology acceptance by salespersons responsible for delivering food access to PDS beneficiaries:

First, as e-government expands in developing countries, there is a need to study the interaction between intermediaries and technology. Intermediary-user-technology relationships are particularly salient when ICTs are implemented in brick-and-mortar government operations. As facilitators of access to physical goods, salespersons are both intermediary-users and beneficiaries of technology. Salespersons use the same technology to service beneficiaries and complete logistical operations related to tallying inventory, declaring sales, and requesting stock deliveries with greater efficiency. Extant e-government research has largely defined intermediaries as distinct from beneficiaries (Kumar & Best, 2006).

Second, we measure intermediaries' attitudes toward technology in contrast to extant research that has examined citizen attitudes toward intermediaries and technology (Al-Sobhi et al., 2010). Despite continued interest in intermediation processes, little is known about their attitudes toward technology in e-government contexts. In measuring salespersons' attitudes toward technology, we attempt to fill this gap in the e-government literature.

Third, understanding the contextual factors that influence salespersons' attitudes toward technology can inform strategies for recruiting, training, and retaining honest salespersons who are adept at using technology. Salespersons may be predisposed against new technologies because of socioeconomic barriers and limited experience with technology. Older salespersons with significant experience operating shops might express dissatisfaction with new technologies that disrupt traditional methods of managing transactions and inventory. Users who feel threatened by ICTs as instruments of increased transparency may sabotage equipment, misappropriate supplies, and significantly increase implementation costs. Salespersons may also benefit from technology use that eliminates manual methods of recording inventory and clarifies their contribution toward increased transparency in operations.

Fourth, the adoption of e-government technology has largely been studied in voluntary use scenarios (Chan et al., 2010), whereas we study a case of mandatory adoption. Models of e-government adoption assume the user exercises a choice in whether to use a technology. In contrast, organizations and governments often mandate technology use. In mandatory settings, users must employ the technology to retain their jobs and perform their assigned tasks (Brown, Massey, Montoya-Weiss, & Burkman, 2002). Users' satisfaction with technology assumes importance over their intention to use technology in mandatory settings (Brown et al., 2002; Chan et al., 2010).

From an e-government perspective, *mandatory ICT adoption* refers to scenarios wherein beneficiaries and intermediaries must adopt specific technologies to access, receive, and provide government services. E-government scholars working in developing countries have acknowledged the need to focus on mandatory use scenarios (Rana et al., 2013b). In mandatory settings, users may exhibit varying satisfaction with

technology and lower levels of loyalty toward stakeholders (Chan et al., 2010). User satisfaction includes favorable and unfavorable responses toward continued use of technology (Brown et al., 2002). Such responses may influence the sustainability of ICT implementations (Chan et al., 2010; DeLone & McLean, 1992). We examine which factors influence salespersons' satisfaction with ICTs that are introduced to streamline FPS operations.

3. Theoretical Background

Technology acceptance models (TAMs) were originally developed to study white collar workers' beliefs and attitudes toward information technology and to predict the adoption and use of information systems (IS) in Western organizations that seek to increase operational productivity and efficiency. More recently scholars have investigated technology use and socioeconomic outcomes of nongovernmental (De Silva, Ratnadiwakara, & Zainudeen, 2011; Venkatesh, Sykes, & Venkatraman, 2014) and governmental (Al-Sobhi et al., 2010) initiatives to bridge the digital divide in developing countries. Others (Oshlyansky, Cairns, & Thimbleby, 2007) have confirmed the crosscultural validity of several TAMs by comparing users across Western and non-Western contexts.

The *Unified Theory of Acceptance and Use of Technology* (UTAUT) is a parsimonious framework that integrates 32 predictor variables from eight previous behavioral models of technology acceptance into a four-factor, four-moderator model predicting intention to use and usage (Venkatesh, Morris, Davis, & Davis, 2003). UTAUT is technology- and application-agnostic in contrast to previous technology acceptance frameworks (Bwalya & Mutula, 2014). The generalizability of UTAUT's core constructs is demonstrated by the diversity of technologies, application scenarios, and geographical settings for which adoption has been studied (Al-Gahtani, Hubona, & Wang, 2007; Chan et al., 2010; Gupta, Dasgupta, & Gupta, 2008).

Models of technology acceptance represent a universalistic perspective of ICT adoption. ICTD studies in developing countries that follow the "transfer and diffusion approach" (Avgerou, 2010, p. 3) to measure citizens' attitudes toward ICTs lack an account of the social embeddedness of technologies (Avgerou, 2010). However, TAMs in general, and UTAUT in particular, have enabled researchers to identify specific social and organizational factors that affect technology uptake and to verify the local relevance of model results to specific sites in the Global South. Recent applications of UTAUT have emphasized contextually appropriate organizational practices and rejected the assumption that generic technical know-how or best practices can be transferred from developed to developing nations (Avgerou, 2010; Venkatesh et al., 2014). Instead, researchers have employed UTAUT to identify adaptations specific to "the socio-organizational conditions of developing countries" (Avgerou, 2010, p. 4) while retaining methodological assumptions regarding the transferability of constructs across geographies.

Despite UTAUT's status as a leading contemporary theoretical framework predicting technology acceptance and use, it has been infrequently used in e-government contexts (Rana, Dwivedi, & Williams, 2013a). A systematic review and meta-analysis by Rana et al. (2013a) indicated a dearth of studies: Fewer than 15% of empirical e-government adoption studies employed UTAUT. Within the e-government literature, UTAUT has been partially applied as a guiding framework (Chan et al., 2010; Gupta et al., 2008) or integrated with complementary theories (Zhou, Lu, & Wang, 2010). Using UTAUT, researchers have explained a higher proportion of variance in users' behavioral intention and usage than with previous models (Venkatesh et al., 2003). E-government studies employing UTAUT have emphasized intention over use, indicating that e-government adoption has primarily been theorized as a voluntary rather than a mandatory process. Only two of the 13 e-government studies guided by the UTAUT framework measured use behavior (Rana et al., 2013b), further indicating the voluntary nature of technology adoption in e-government studies.

When a system under study involves the large-scale mandated adoption of technology, satisfaction may be a more appropriate dependent variable than intention (Brown et al., 2002; Chan et al., 2010). Satisfaction is a key metric influencing sustainability of technology adoption in organizational, e-government, and ICTD contexts (Bhatnagar & Singh, 2010; Chan et al., 2010; DeLone & McLean, 1992). From a validation perspective, our primary objective in this exploratory study was to check the reliability and validity of the original UTAUT model in terms of its direct and indirect (moderating) effects. Therefore, in the direct effects model we

measured the proportion of variance in salespersons' perceived satisfaction with POS machines and their implementation that can be explained by UTAUT variables: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC; Venkatesh et al., 2003). In the indirect effects model, the four exogenous variables were hypothesized to predict salespersons' satisfaction under the moderating influences of age, experience with technology, experience with shop operations, and education level.

4. Research Model

Performance expectancy (PE) is defined as the degree to which a user believes that employing technology will improve daily job-related performance. PE is a strong predictor of intention to use technology in voluntary scenarios (Venkatesh et al., 2003) and satisfaction with technology in mandatory settings (Chan et al., 2010). PE in an e-government context refers to efficiency and productivity gains such as savings in time, money, and effort obtainable when interacting with government (Al-Shafi & Weerakkody, 2009). In developing countries PE has been observed to significantly affect intention to use technology across a range of voluntary and mandatory use scenarios, including adoption of desktops by government workers (Al-Gahtani et al., 2007), mobile e-government by rural users (Liu et al., 2014), e-government learning tools by students (Al-Awadhi & Morris, 2008), ICTs by government agencies (Gupta et al., 2008) and citizens (Al-Shafi & Weerakkody, 2009; Rana et al., 2013a).

PE measures salespersons' perceptions regarding the usefulness of POS machines for tasks such as monitoring stock and conducting beneficiary transactions. PE also indicates perceived qualitative and quantitative gains or losses in salesperson task performance. Salespersons who perceive POS machines as useful for daily operations are more likely to be satisfied with such technology. We hypothesize:

H1. *Performance expectancy will positively influence salesperson satisfaction with POS machines.*

Effort expectancy (EE) is defined as the degree to which users find technology easy to use. Similar to PE, several studies of e-government adoption in developing countries uncovered a significant relationship between EE and intention to use technology (Al-Awadhi & Morris, 2008; Al-Shafi & Weerakkody, 2009; Gupta et al., 2008). We measured EE as the degree of effort that salespersons perceive is required to learn to use the POS machine and the ease of conducting shop operations. Salespersons may experience greater satisfaction when less effort is needed to use the machine during the initial stages of implementation. We hypothesize:

H2. *Effort expectancy will positively influence salesperson satisfaction with POS machines.*

Social influence (SI) is defined as the extent to which individual users perceive that important persons (friends, family, colleagues, supervisors) believe they should use technology. The significance of social influence varies, depending on the stage and voluntariness of technology adoption (Venkatesh et al., 2003). Organizational studies of IS adoption indicate that adoption in early stages and mandatory settings are more likely to be influenced by perceptions of subjective norms and peer expectations. The significant effect of SI on satisfaction during mandatory adoption suggests that observation of norms may lead to peer-induced compliance (Venkatesh et al., 2003).

SI may help salespersons overcome initial resistance to POS machine use. Salespersons may perceive greater respect within their community upon using POS machines. An increase in perceived status may result from the similarity between such technologies and other aspirational technologies such as smartphones and tablets. The transparency and efficiency introduced by the use of such technologies may also help salespersons improve their reputation in the community. Several e-government studies in developing countries (Al-Awadhi & Morris, 2008; Al-Shafi & Weerakkody, 2009; Gupta et al., 2008) found SI had a significant effect on primary users' intentions to adopt. We hypothesize:

H3. *Social influence will positively influence salesperson satisfaction with POS machines.*

Facilitating conditions (FC) refers to the extent to which an individual perceives that adequate organizational and technical infrastructure exists to support technology use. Users may be more satisfied when they discern training and support are available to resolve technical issues. FC refers to salespersons' perceptions about

the availability of adequate training on POS machines and troubleshooting support. FC assumes greater importance for salespersons given the likely need for training and support during initial adoption. For instance, new salespersons were provided training on POS machines by the government over a three-day period, but would subsequently request technical support from the government regarding known issues (e.g., resetting a POS machine with a static screen error). However, e-government scholarship is silent on the significance of FC's effect on usage. Whereas some e-government studies indicated a significant positive effect of FC on usage behavior (UB; Gupta et al., 2008; Venkatesh et al., 2003; Wang & Shih, 2009), others (Al-Gahtani et al., 2007) observed a weak negative effect of FC on UB. Longitudinal research, however, suggests that FC exerts a significant positive effect on UB as users' experience with e-government increases (Al-Gahtani et al., 2007). We hypothesize:

H4. *Facilitating conditions will positively influence salesperson satisfaction with POS machines.*

4.1 Moderating variables

4.1.1 Age
The UTAUT model hypothesizes a moderating influence by age on the relationships among PE, EE, SI, and behavioral intention (BI) to use technology and also on the relationship between FC and UB (Venkatesh et al., 2003). Wang and Shih (2009) found that older users were more likely than younger users to report a higher perceived ease of use of e-government and a higher BI.

Age appears to be underexamined by researchers studying technology adoption in developing countries. Several studies have omitted age distribution in samples or reporting the distribution of participant ages for the purpose of establishing sample representativeness (Al-Awadhi & Morris, 2008; Al-Gahtani et al., 2010; Gupta et al., 2008). Among studies that measured the relationship between age and adoption, FC is often omitted as a moderating variable because of a focus on intention (BI) over usage (UB; AbuShanab & Pearson, 2007). Hamner and Al-Qahtani (2009) reported a negative relationship between citizens' age and their willingness to use e-government technology. AbuShanab and Pearson (2007) observed that PE's effect on BI was stronger for older users, contradicting the UTAUT prediction that PE's effect on BI would be stronger for younger users. AbuShanab and Pearson (2007) also observed a stronger effect of EE on BI for younger users. Age did not significantly moderate the SI-BI relationship, contradicting conventional UTAUT findings.

Among FPS salespersons, younger users may be more attracted to the task and relational benefits of using POS machines. Younger salespersons familiar with mobile phones, computers, and the Internet may find POS machines both aspirational (SI) and easier to use (EE). Older users with greater experience in FPS operations may more likely perceive an improvement in their social standing and reputation, thanks to perceptions among beneficiaries and peers of the increased transparency introduced by POS machines. Younger and older salespersons alike may prefer the practical advantage of automated recordkeeping, emphasizing technology's usefulness (PE) over traditional manual recordkeeping. Younger salespersons may be less familiar with traditional bookkeeping methods and more willing to switch to newer techniques. Older rather than younger salespersons may be more likely to rely on training and support (FC) to continue using the technology. Hence, we hypothesize:

H1a. *Age will significantly moderate the relationship between performance expectancy and salesperson satisfaction with the use of POS machines.*

H2a. *Age will significantly moderate the relationship between effort expectancy and salesperson satisfaction with the use of POS machines.*

H3a. *Age will significantly moderate the relationship between social influence and salesperson satisfaction with the use of POS machines.*

H4a. *Age will significantly moderate the relationship between facilitating conditions and salesperson satisfaction with the use of POS machines.*

4.1.2 Experience with technology
UTAUT posits that experience with technology moderates the EE-BI and FC-UB relationships. Organizational IS research suggests less experienced users may be more likely to benefit from ease of use (EE), evidenced

by increased intention to use (BI). In addition, more experienced users may be more likely to exhibit a stronger FC-UB relationship, particularly during the early stages of adoption (Venkatesh et al., 2003). The effect of SI on BI is hypothesized to be stronger for users with limited experience. In contrast, research on IS adoption in developing countries presents a more complex picture of the effect of experience on adoption. AbuShanab and Pearson (2007) suggest that technology experience may not be a significant moderator of the EE-BI relationship. Al-Shehri, Draw, and Al-Ghamdi (2013) found that experience with technology positively moderated the EE-BI relationship, whereas Al-Gahtani et al. (2007) observed a negative moderating influence of technology experience. Al-Gahtani et al. (2007) and Al-Shehri et al. (2013) found supporting evidence for UTAUT's prediction that experience with technology would strongly positively moderate the FC-BU and FC-BI relationships, respectively. Al-Gahtani et al. (2007) observed that experience with technology negatively moderated SI-BI relationship. In contrast, AbuShanab and Pearson (2007) found experience with technology to be a significant positive moderator of the SI-BI relationship.

Increased experience with technology might have a significant influence on salespersons' satisfaction vis-à-vis the ease of use (EE) and usefulness (PE) of POS machines, especially for salespersons with experience using mobile phones, computers, and the Internet. Salespersons with greater technology experience may perceive higher satisfaction with a technology that affords them increased reputation (SI) in the community as honest providers of goods and services. Salespersons' satisfaction with technology would likely increase with increased technology experience, provided they continued to receive adequate infrastructural and training support (FC). Hence, we hypothesize:

H1b. Experience with a POS machine will significantly moderate the relationship between performance expectancy and satisfaction with the use of a POS machine.

H2b. Experience with a POS machine will significantly moderate the relationship between effort expectancy and satisfaction with the use of a POS machine.

H3b. Experience with a POS machine will significantly moderate the relationship between social influence and satisfaction with the use of a POS machine.

H4b. Experience with a POS machine will significantly moderate the relationship between facilitating condition and satisfaction with the use of a POS machine.

4.1.3 Experience with operations

Experience with shop operations was a novel contextual variable we identified during preliminary data collection. While past e-government studies in developing countries had not measured the amount of time participants had been involved in intermediary roles, we observed that salespersons' experience working in FPSs ranged from a few months to decades. Employees with greater operational experience may be more likely to be dissatisfied with changes in work practices introduced by mandatory technology adoption. Alternatively, experienced salespersons may be motivated to learn newer technologies if they find that a POS machine is designed to simplify daily transactions and easy to use. Experienced salespersons are more likely to make practical use of training, provided the technology alleviates prevailing negative stereotypes of complicity in corruption. Salespersons might then incorporate perceptions of friends and family into their own views regarding the technology. We hypothesize:

H1c. Experience with FPS operations will significantly moderate the relationship between performance expectancy and satisfaction with the use of POS machines.

H2c. Experience with FPS operations will significantly moderate the relationship between effort expectancy and satisfaction with the use of POS machines.

H3c. Experience with FPS operations will significantly moderate the relationship between social influence and satisfaction with the use of POS machines.

H4c. Experience with FPS operations will significantly moderate the relationship between facilitating condition and satisfaction with the use of POS machines.

4.1.4 Education level

While education level was not included in the original UTAUT model, users' familiarity with and use of technology are likely to increase with education. More educated users are hypothesized to experience lower levels of computer anxiety (Igbaria & Parasuraman, 1989), encounter fewer barriers to adoption, and be more likely to adopt new technologies earlier (Dwivedi & Lal, 2007). The positive effect of education level on adoption and use has been observed to be limited to higher order complex tasks rather than routine tasks that involve use of equipment such as a retail scanner or sales terminal. Despite the lower order nature of the tasks carried out using POS machines, education level may affect salespersons' perceptions toward ease of use (EE) and usefulness (PE) of POS machines.

Some salespersons are college-educated young persons who are familiar with mobile phones, computers, and browsing the Internet. Other salespersons ended their studies at or before high school. Less educated salespersons may appreciate technologies that simplify everyday tasks such as calculating cash, food balances, and stock levels. Subjective norms among peers may lead those salespersons to enjoy using a device resembling expensive smartphones and tablets. On the other hand, more educated salespersons might not value the utility of POS machines if they had previously used phones and computers to perform such computations. They might be more likely to use training to learn about and employ the functionality of POS machines. Given the variation in the education levels of POS machine users, we hypothesize:

H1d. Education level will significantly moderate the relationship between performance expectancy and satisfaction with the use of POS machines.

H2d. Education level will significantly moderate the relationship between effort expectancy and satisfaction with the use of POS machines.

H3d. Education level will significantly moderate the relationship between social influence and satisfaction with the use of POS machines.

H4d. Education level will significantly moderate the relationship between facilitating condition and satisfaction with the use of POS machines.

Figure 1 depicts the research model tested in this study.

5. Research methodology

5.1 Instrument development

The research model was evaluated through a questionnaire-based survey. Construct measurements were obtained from previously validated questionnaire items and are included in Appendix A. Following salespersons' use, "POS machine" was employed as a catchall term for technology that included POS machines, smartcards, and GPRS technology connecting POS machines to servers. A seven-point Likert-type scale ranging from Totally Disagree (−3) to Totally Agree (+3) was used to measure participants' perceptions regarding EE, PE, SI, and FC. Satisfaction was measured on a seven-point Likert-type scale ranging from Extremely Displeased (−3) to Extremely Pleased (+3) for Satisfaction1 and Extremely Dissatisfied to Extremely Satisfied for Satisfaction2. The moderating variables measured were age, sex, education level, and experience with a POS machine and FPS.

Several salespersons were likely to have been working in an FPS for many years. Consequently, the degree of change to a business process (operating style) was measured through self-reported and observed variables measuring transaction time for manual versus online data entry, frequency of POS machine use, average time spent using a POS machine, and time taken to complete offline tasks such as weighing and distribution. Given the exploratory nature of the study and the lack of e-government studies employing UTAUT in a comprehensive way to study intermediary satisfaction (Weerakkody et al., 2013), we limit our report here to validating UTAUT.

Face validity measures the ease with which respondents can understand questionnaire items with reference to the likelihood that descriptions in the questionnaire were probable, the items were readable, word usage
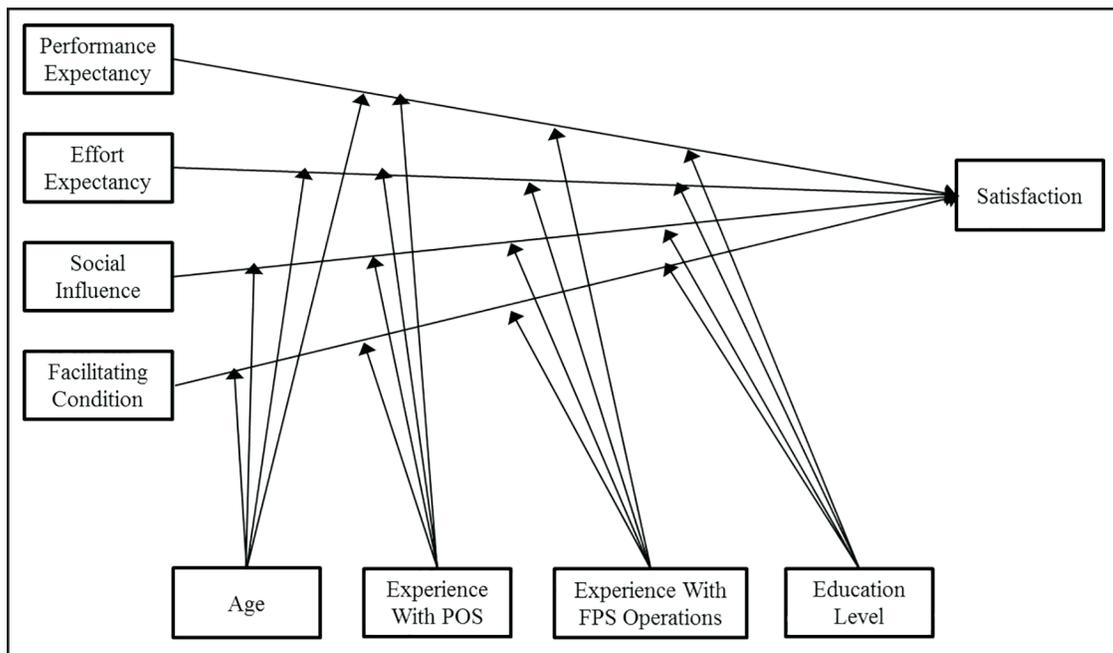
Figure 1. Research model.

was consistent, and the language used was clear (DeVon et al., 2007). Such evaluations are subjective assessments conducted by experts or laypersons and provide insight into how potential participants might "interpret and respond to the items" (DeVon et al., 2007, p. 157). Face validity was assessed through a combination of over 100 hours of participant observation and interviews with (a) five salespersons using POS machines daily for 12 months, (b) the two most senior field engineers responsible for providing training and technical support to salespersons, (c) the two software programmers who, together, developed the entire code used to operate the POS machines, and (d) a senior scientist managing project implementation at the state level. We asked this team of individuals to help assess face validity because they had worked on the project from its inception and were responsible for addressing user requirements and complaints in two of the three districts where data was collected.

We adopted a snowball technique and contacted the field engineers and programmers following an initial email and telephonic and face-to-face conversations with the scientist. We were allowed to consult with and observe the team and salespersons after we presented our proposed research design where we clarified the potential for our research to provide insights into the sustainability of ICT-based services for shops in other districts. Following our presentation it was agreed that no monetary or other incentives would be provided to any participants so as to prevent acquiescence bias. Questionnaire items were translated from English to Hindi with the assistance of bilingual field engineers who had assisted in assessing the face validity of the questionnaire items. Translation steps were repeated until the items in the English and Hindi questionnaires had the same meaning (Behling & Law, 2000).

5.2 Sampling
The criterion for selecting salespersons was whether they operated POS machines. The sampling pool included all 218 shops using POS machines to manage operations. The government provided each shop with one POS machine, which was operated by one salesperson. Both authors made initial recruitment visits with each of the 218 shops' salespersons.

We introduced the study to each potential participant by first confirming that the contacted salesperson

Table 2. Characteristics of the Respondents.

Characteristics	Number	Percent (%)
Gender		
Female	13	8
Male	153	92
Age		
≤20	3	2
21–30	62	37
31–40	52	36
41–50	27	17
≤51	13	8
Missing values	9	5
Education		
≤5th grade	7	4
Secondary level (10th grade)	50	30
Higher secondary (12th grade)	54	33
Tertiary (college level)	55	33
Experience with POS		
≤12 months	73	44
13–24 months	74	45
≤25 months	14	8
Missing value	5	3
Experience with FPS		
≤10 year	116	70
11–20 year	31	19
≤21 year	13	8
Missing value	6	4

used a POS machine. Upon receiving confirmation, we explained the study's purpose and invited the salesperson to participate in the study. Individuals who agreed were asked to provide demographic information that included age, sex, and educational attainment. Those who had studied at the college level were assumed to be comfortable reading the questionnaire and were asked to complete it on their own. A 10-minute debriefing was carried out with each salesperson to verify their responses. Others participated in a sit-down interview lasting approximately 45 minutes to an hour during which the authors marked participants' responses to each item.

Of the 218 FPSs contacted, 191 chose to participate in the study. Questionnaires were returned by 179 participants, of which 13 were incomplete, resulting in 166 usable responses. Descriptive statistics on the 166 responses are presented in Table 2.

5.3 Data analysis and results

Analysis was conducted using the method of partial least squares (PLS) implemented in SmartPLS (SmartPLS [Version 2.0], n.d.). PLS is a structural equation modeling technique that places minimum restrictions on scales, sample size, and residual distributions (Chin, 1998). For the measurement model containing only direct effects (with the influence of moderating variables omitted), composite reliability scores of all constructs exceed 0.8

Table 3. Composite Reliability, AVE, and Discriminant Validity of the Constructs.

	Composite Reliability	AVE	PE	EE	SI	FC	Satisfaction
PE	0.83	0.55	**0.74**				
EE	0.85	0.66	0.69	**0.81**			
SI	0.87	0.69	0.62	0.58	**0.83**		
FC	0.85	0.54	0.51	0.54	0.38	**0.73**	
Satisfaction	0.86	0.75	0.67	0.65	0.64	0.43	**0.87**

*The square root of AVE is shown in diagonal.

Table 4. Factor Loading Matrix.

	PE	EE	SI	FC	Satisfaction
PE1	**0.75**	0.54	0.54	0.48	0.55
PE2	**0.71**	0.57	0.43	0.31	0.47
PE3	**0.73**	0.48	0.46	0.36	0.47
PE4	**0.78**	0.45	0.42	0.36	0.50
EE1	0.50	**0.80**	0.41	0.52	0.46
EE2	0.58	**0.84**	0.50	0.35	0.59
EE3	0.58	**0.80**	0.49	0.46	0.51
SI1	0.56	0.53	**0.84**	0.30	0.58
SI2	0.52	0.45	**0.86**	0.36	0.50
SI3	0.46	0.45	**0.79**	0.28	0.50
FC1	0.46	0.48	0.33	**0.82**	0.33
FC2	0.35	0.48	0.26	**0.83**	0.37
FC3	0.34	0.38	0.26	**0.74**	0.30
FC4	0.46	0.36	0.35	**0.76**	0.35
Satisfaction1	0.57	0.59	0.58	0.45	**0.87**
Satisfaction2	0.60	0.52	0.52	0.28	**0.86**

(Nunnally, 1978). Discriminant validity is indicated by Average Variance Extracted (AVE) and construct correlations. AVE for each construct exceeds 0.5, and the square root of AVE exceeds the off diagonal construct correlations, satisfying discriminant validity as indicated in Table 3 (Fornell & Larcker, 1981). All outer model loadings exceed 0.70 (threshold value = 0.50) and were statistically significant at $p < 0.0001$, with loadings on constructs measuring higher than cross-loadings (see Table 4; Fornell & Larcker, 1981). Results provide adequate support for reliability and discriminant and convergent validities at the indicator level for the sample.

Statistical significance of the path coefficients for the direct effects model was assessed by a running bootstrap procedure using 500 resamples in SmartPLS (SmartPLS [Version 2.0], n.d.). Figure 2 indicates that performance expectancy ($\beta = 0.3$, $p < 0.05$), effort expectancy ($\beta = 0.26$, $p < 0.05$), and social influence ($\beta = 0.3$, $p < 0.05$) have a direct positive impact on satisfaction of the salesperson operating the POS machine ($R^2 = 0.57$). The effect of facilitating conditions on satisfaction is not statistically significant at the 0.05 level.

Moderating effects of the continuous variables age, experience with POS, and experience with FPS operations on the relationships between the latent exogenous and endogenous constructs were estimated through the product term approach following Chin and Newsted, 1999. The partial least squares structural equation modeling (PLS-SEM) procedure was employed to study the interaction effect of continuous moderating
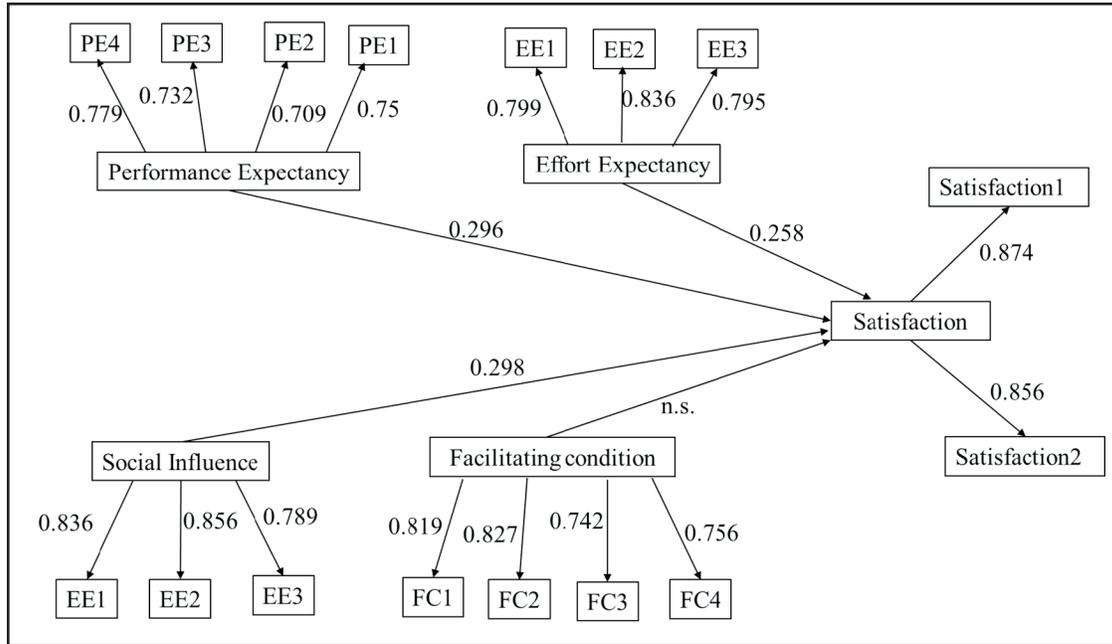
Figure 2. Structural model results.
Note: n.s. = not significant.

variables (Hair, Hult, Ringle, & Sarstedt, 2013; SmartPLS [Version 2.0], n.d.). Given the large number of exoge-
nous constructs in the SEM, individual moderating variables were run separately to ensure that adequate sta-
tistical power was obtained. To assess the significance of interaction and main effects, a bootstrap resampling
procedure was performed with 2,000 samples (Hair et al., 2013). Table 5 provides values of predictor beta,
moderator beta, and interaction effect as well as R^2 values for statistically significant interaction effects.

Column 4 in Table 4 lists the standardized beta values of the paths from each latent construct (Column 1) to
Satisfaction. Column 5 in Table 4 lists the standardized beta values of the paths from each moderating variable
(Column 2) to Satisfaction. Column 6 values indicate the variation in the influence of exogenous constructs on
Satisfaction as a function of changes in the moderating variable. Standardized beta values measure in standard
deviation units the change in the value of the dependent variable as a consequence of a unit change in the
independent variable (Cohen, Cohen, West, & Aiken, 2013). For example, SI's influence on Satisfaction when
moderator age is held at zero is 0.28. When we account for the moderator age being 0.06 SD units above the
mean, the influence of SI on Satisfaction is equal to the sum of the predictor beta value (0.28) and the interac-
tion term (0.10), increasing to 0.38. In addition, we assess the size of moderating effects by comparing the R^2
of the direct effects model with the R^2 of the model with moderating effects included. The direct effects model
has an R^2 of 0.57, while the R^2 values of the full model range from 0.56 to 0.59. The effect size ranges from
0.02 to 0.05, corresponding to a weak-to-moderate size of the effect of moderating variables (Cohen et al.,
2013). The effect size range obtained also represents the average for past IS studies (Chin & Newsted, 1999).

PLS multigroup analysis (PLS-MGA) was conducted to analyze the moderating effect of education level, a
categorical variable. Seven responses indicating primary (5th grade) level educational attainment were dropped
due to the small sample size. Differences in the moderating effect of the three remaining education level cate-
gories—secondary (N = 50), higher secondary (N = 54), and tertiary (college; N = 55) education—were
tested via multigroup moderation analysis (Henseler & Fassott, 2010). Statistically significant differences were
observed between path coefficients for higher secondary and tertiary for PE-Satisfaction and SI-Satisfaction
relationships, described in Table 6. Nonsignificant differences were observed for all other relationships across
the three education level categories.

Table 5. Statistically Significant Standardized Beta Values and Interaction Effects for Age, Experience with POS, and Experience with FPS on Satisfaction.

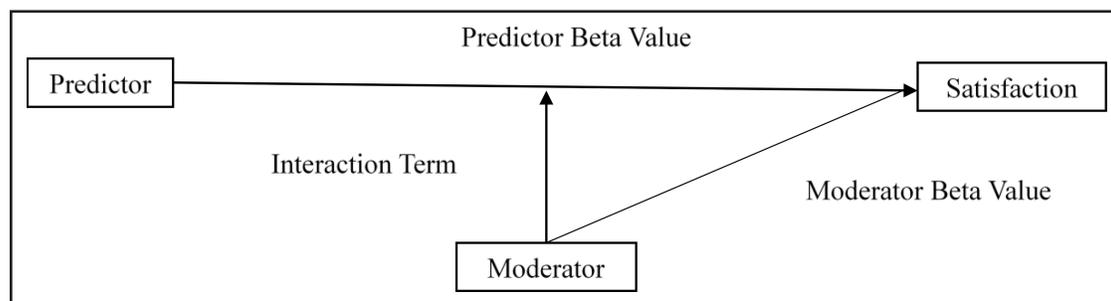| 1	2	3	4	5	6	7
Predictor	**Moderator**	**R^2**	**Predictor Beta Value (standardized)**	**Moderator Beta Value (standardized)**	**Interaction Term**	**Effect Size (f^2)**
SI	Age	0.58	0.28	0.06	0.10	0.03
EE	Age	0.58	0.29	0.04	0.09	0.03
SI	Experience with FPS	0.59	0.29	0.02	0.15	0.05
PE	Experience with FPS	0.59	0.28	−0.003	0.14	0.04
FC	Experience with FPS	0.58	0.06	−0.01	0.10	0.02
SI	Experience with POS machine	0.58	0.26	−0.03	0.12	0.03

Figure 3. Schematic depicting interaction effect.

Table 6 reports the results of comparisons of path coefficients p(1) and p(2) for groups reporting tertiary-level education (Group 1) and higher secondary–level education (Group 2). Group 2 exhibits a significantly stronger PE-Satisfaction relationship ($t = 4.037$, $p < 0.001$) than Group 1, supporting hypothesis H1d. Additionally, the path coefficient from SI to satisfaction for Group 1 is significantly stronger than the path coefficient for Group 2 ($t = 3.308$, $p = 0.001$), supporting H3d. H2d (EE-Satisfaction) and H4d (FC-Satisfaction) were not supported when comparing the full models with education level employed as a grouping moderator variable.

Table 7 presents the hypotheses, the outcome of the hypothesis tests (Findings column), whether the hypothesis was supported (Conclusion), and the correspondence of Findings to the literature (UTAUT Findings).

6. Discussion

6.1 Direct and indirect effects

The objective of this study was to situate existing models theorizing technology acceptance in the context of public food distribution in Chhattisgarh, India by integrating existing and new variables into a technology acceptance model predicting both direct and indirect effects on stakeholder satisfaction with technology. Results of the PLS analysis provide strong empirical support for the reliability and validity of UTAUT. As suggested by Venkatesh et al. (2003), EE, PE, and SI were found to exert a significant, positive effect on satisfaction in the absence of a moderating variable. FC shows no significant interaction with satisfaction. Table 8 lists moderators that were observed to have a statistically significant effect on specific endogenous-exogenous variable relationships.

Table 6. Moderating Effect of Education Level Through Group Comparison.

	Group 1: College N = 55		Group 2: 12th Grade N = 54		Group 1 vs. Group 2		
	p(1)	SE(1)	p(2)	SE(2)	|p(1)−p(2)|	t value	p value
PE → Satisfaction	0.389	0.101	1.251	0.190	0.861	4.037	<0.001
SI → Satisfaction	0.588	0.103	0.025	0.138	0.563	3.308	0.001

6.2 Age

Consistent with past findings, the effect of SI on satisfaction increases with age (Venkatesh et al., 2003). Older salespersons appear more likely to value the opinions of peers, family, and friends regarding the benefits of using POS machines. Past research suggests that age does not significantly moderate the relationship between EE and behavioral intention (Al-Gahtani et al., 2007). Our results supporting H2a suggest that older users who report higher ease of use may be more likely than younger users to report higher levels of satisfaction. This contrasting finding may be further examined in relation to the moderating effect of experience operating FPSs and experience with POS machines and on the PE–Satisfaction relationship.

6.3 Experience with operations

Experience in running an FPS has a significant positive moderating effect on PE/Satisfaction (H1c), SI/Satisfaction (H3c), and FC–Satisfaction (H4c) relationships. Experienced salespersons are more likely to perceive POS machines as useful (PE) and report higher levels of satisfaction. Salespersons operating an FPS for several years may have a clearer idea of the social benefits accruing from increased transparency. In contrast to the lack of significance of the FC–Satisfaction relationship in the direct effects model, experienced salespersons appear more likely than their less experienced counterparts to attribute higher levels of satisfaction to the training and support provided by the government (FC).

We acknowledge the contrasting results for FC across direct and indirect effects models. The theoretical framework adopted includes FC as a predictor variable, requiring that it be included when testing for direct and indirect effects. We draw attention to the heuristic purpose served by these results. While our study's sample size prevented a statistical investigation of higher order interactions between moderating and predictor variables, our interest in exploring the architecture of higher order interactions underlying the model leads us to contemplate the salience of the moderating effect of experience with operations on satisfaction.

Past research on the adoption of smartcard-based e-government services has yielded contradictory results regarding the effect of FC on citizen satisfaction. Initial studies (Venkatesh et al., 2003) suggested that FC does not exert a direct effect on usage. Chan et al. (2010) found that FC has a significant effect on satisfaction under conditions of mandatory use. Results for hypotheses H1c, H2a, and H4c examine the combination of user attributes for which facilitating conditions may become salient as a predictor of satisfaction.

Comparing results for H1c, H2a, and H4c, we may speculate on the characteristics of users most likely to be highly satisfied with POS machines. Salespersons with higher operational experience are likely to exhibit greater appreciation for the usefulness (higher PE) of the technology (H1c) and for the support and training provided by the government (H4c). The relationship between EE and satisfaction is stronger for older salespersons than younger salespersons (H2a). Older salespersons are also more likely to have greater experience with FPS operations and, therefore, appreciate the usefulness (PE) of the technology in completing daily tasks. With adequate training and support, older, more experienced users may perceive a new technology as easy to use and useful.

6.4 Experience with technology

Experience with POS machines (H3b) positively moderated the relationship between SI and satisfaction. SI has a stronger influence on satisfaction levels for salespersons using a POS machine for a longer time. This result contrasts with findings from past research that suggests SI's significance is limited to early stages of technology

Table 7. Results of Hypothesis Tests.

Moderating Variable	Hypothesis	Findings	Conclusion	UTAUT Findings
Age	H1a	Not significant	Not supported	Not significant
Age	H2a	Significant Beta = 0.087 P < 0.01	Hypothesis supported, positive relation	Not significant
Age	H3a	Significant Beta = 0.104 P < 0.005	Hypothesis supported, positive relation	Yes (positive) Beta = 0.02, n.s.
Experience with POS machine	H1b	Not significant	Not supported	No interaction evaluated
Experience with POS machine	H2b	Not significant	Not supported	Yes (positive) Beta: 0.02, n.s.
Experience with POS machine	H3b	Significant Beta: 0.116 P < 0.005	Hypothesis supported, positive relation	Yes (positive) Beta: 0.04, n.s.
Experience with POS machine	H4b	Not significant	Not supported	Yes (positive) Beta: 0.00 n.s.
Experience with FPS	H1c	Significant Beta: 0.137 P < 0.01	Hypothesis supported, positive relation	Not measured
Experience with FPS	H2c	Not significant	Not supported	Not measured
Experience with FPS	H3c	Significant Beta: 0.146 P < 0.001	Hypothesis supported, positive relation	Not measured
Experience with FPS	H4c	Significant Beta: 0.097 P < 0.01	Hypothesis supported, positive relation	Not measured
Education level	H1d	Significant Beta: 4.037 P < 0.001	Hypothesis supported, negative relation	Not measured
Education Level	H2d	Not significant	Not measured	Not measured
Education level	H3d	Significant Beta = 3.308 p < 0.001	Hypothesis supported, positive relation	Not measured
Education level	H4d	Not significant	Not supported	Not measured

adoption (Venkatesh et al., 2003). Dissemination of smartcards and POS machines may raise social awareness regarding the potential and actual benefits to both salespersons and beneficiaries who live in the same neighborhood as the salespersons.

Positive perceptions among beneficiaries toward the new technology may lead salespersons using POS machines to experience greater intermediary trust (Weerakkody et al., 2013) and satisfaction. During interviews salespersons reported positive benefits from transparency. As one salesperson said,

> Thanks to the machine, information on stocks and food balances is easily available to all beneficiaries. We no longer have to cave under pressure from local politicians and goons to illegally divert entitlements. We are happy with the machine because nobody can cast doubt on our honesty.

6.5 Education level

Education level was observed to have a positive moderating effect on PE–Satisfaction (H1d) and SI–Satisfaction (H3d). SI's positive effect on satisfaction was observed to be stronger for salespersons with college-level

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Table 8. Overview of Significant Moderating Effects.

Endogenous Variable	Exogenous Variable	Moderator
Satisfaction	SI	Age
		Experience with POS
		Experience with FPS
		Education level
	EE	Age
	PE	Experience with FPS
		Education level
	FC	Experience with FPS

education compared to those terminating education in high school. Salespersons who completed college indicated that they achieved a degree of respect among their peers for using a technology similar to smartphones and tablets. One participant explained, "My friends feel as though I am using a Galaxy Note [a high-end tablet] when they see me operating the POS machine." Another possible explanation for SI's stronger influence on satisfaction among more educated salespersons could be that they are able to convey an incorruptible image by using a technology that promotes transparency. This finding is corroborated by the observed moderating effect of age on SI–Satisfaction. Older, more educated salespersons may value the opinions of peers, family, and friends regarding the benefits of using POS machines.

Education level is a significant negative moderator of the relationship between PE and satisfaction. Familiarity with ICTs may lead users with higher educational attainment to disregard the benefits obtained from using POS machines. Less educated salespersons appear more satisfied with the utility afforded by POS machines, whereas one might expect less educated users to exhibit higher initial computer anxiety (Igbaria & Parasuraman, 1989) or a negative attitude toward ICTs. Less educated salespersons may benefit from the automation of calculations to record account balances, manage inventory, and generate reports, tasks that salespersons with a college-level education might struggle less with. They may use similar technologies (e.g., smartphones, computers) to compute inventory.

7. Practical Implications, Limitations, and Future Research

Our analyses suggest that older, more experienced, less educated users are more likely than their younger, more educated counterparts to experience the influence of effort expectancy and social influence on satisfaction with POS machines. In our work carried out in collaboration with the National Informatics Center, Chhattisgarh, we have sought to leverage these findings by creating audiovisual training materials that emphasize the POS machine's ease of use and its potential to clarify the important role that salespersons play in ensuring transparent and efficient delivery of food to citizens. Recognizing the importance of social influence, we have suggested that a *sahayog pranali* (buddy system) be introduced to recruit experienced salespersons to mentor recent adoptees across the state.

The relatively small sample size (N = 166) may be justified in terms of the high response rate (76%). Results may still be subject to self-selection bias, and participating salespersons may have preconceived notions regarding the purpose and utility of both the technology and the study. We caution against generalizing the findings beyond the sites studied because of the substantial differences likely to exist between sites within Chhattisgarh, in other Indian states, and abroad. We note the proximity among the shops studied (all shops operate within a radius of 60 kilometers), similarity in available infrastructure, and consistency in the training provided to salespersons. Infrastructural factors such as network connectivity may be key determinants of satisfaction in future investigations. The distribution of males and females in the present study, while representative of the skewed gender distribution in the larger population of salespersons studied, prevented a proper

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statistical examination of the moderating effect of gender. Future work based on larger sample sizes may allow the study of possible three-way interactions among age, gender, and experience. We note that corrupt intermediaries who are able to misappropriate e-government technologies toward fraudulent ends may express higher satisfaction levels. Future instrument development may account for such possibilities being afforded by facilitating conditions and social influence. ∎

Acknowledgments

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Appendix A

Survey items used in this study

Latent Construct	Questions with Factor Loading ≤0.7
PE	PE1: POS machine is very helpful for performing the everyday task
PE	PE2: POS machine saves me time for finishing my task
PE	PE3: POS machine reduces the error in my work
EE	EE1: It is easy for me to remember how to perform task using the POS machine
EE	EE2: It easy to recover from the errors encountered while using POS machine
EE	EE3: It is easy for me to become skillful at using POS machine
SI	SI1: People who are important to me think that I should use POS machine
SI	SI2: People respect me more since I use POS machine
SI	SI3: People in my organization who use the POS machine have more prestige than people who do not
FC	FC1: Enough training provided by government to use POS machine
FC	FC2: Government provides support to solve any issue related to POS machine
FC	FC3: Government provides clear instruction on using the POS machine
FC	FC4: It was useful to attain the training camp organized by government
Satisfaction	Satisfaction1: I am _____ with the change in the business process with the implementation of POS machine
Satisfaction	Satisfaction2: I am _____ regarding the continued implementation of POS machines