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Motivating Acceptance of Information and Communication Technologies in Rural Agribusiness: It's Not the Money!

by

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(Research Paper)

ABSTRACT

The study investigates the key motivational driver(s) for the acceptance of a digital procurement (e-purjee) system by sugarcane growers in rural Bangladesh. The e-purjee system is a simple SMS-based purchase order system that replaces a paper-based procurement order system. Treating the acceptance of the e-purjee system as the sugarcane growers' decision problem, and applying a multi-criteria decision making (Zionts & Wallenius, 1976) approach to that problem, the study identifies the trade-offs growers appear to make between non-monetary and monetary decision criteria. The study draws on interviews with local growers to reveal their preferences and their reasoning. The findings indicate that non-monetary incentives, namely procedural fairness and uncertainty reduction, are more important than the positive monetary benefits. Interview responses also suggest that the non-monetary benefits affect small scale growers more than the large scale growers. Based on these findings, we draw several practical and theoretical recommendations about the structuring of incentive systems for rural technology based development projects, and about decision modeling for a relatively untrained informant group.

Keywords: Information and Communication Technologies (ICTs), technology acceptance, digital procurement, E-purjee, agribusiness, multi-criteria decision making, Bangladesh

INTRODUCTION

Recent years have seen the adoption of Information and Communication Technologies (ICTs) in numerous developing country initiatives (e.g., Avgerou, 2008; Dada, 2006; Cook, 2005), frequently through the cooperation of governments with donor agencies such as the United Nations Development Programme (UNDP). The projects are usually intended to increase the well-being of the rural population and are seed funded through the government-development agency partnership. The project success rate has been less than satisfactory (Heeks, 2002), however. Although ICT has been proven as an effective tool to overcome rural users' barrier to information (Aker, 2008; Silva & Ratnadiwakara, 2008; Jensen, 2007) and to bring positive economic and societal changes to rural livelihoods (Dada, 2006), projects often failed, and successes have been seemingly unpredictable. At the same time, highly promising projects have run out of resources and become unsustainable after the initial government and development agency funding seized, whereas projects with only moderate financial paybacks have become surprisingly successful.

Typically it is expected that a new system will sustain itself if it creates enough monetary benefits to convince users to change past habits and to adopt the technology and process associated with the new system. Surprisingly, recent evidences show that users of successful systems may only receive single-digit monetary benefits (Jensen, 2007; Aker, 2008; Alam & Wagner, 2013) from ICT adoption. While single-percentage increases are macro-economically significant, they may not at all be recognizable by individual farmers, who face much larger variances in season-to-season yields due to environmental or market conditions. Hence, in the absence of strong economic benefits, non-financial drivers may explain ICT adoption in these cases. Identification of these drivers is the purpose of our study. To do so, we present findings concerning a mobile-based e-Government initiative in Bangladesh's agribusiness, namely the Digital Procurement System for Sugarcane is popularly known as the 'e-purjee' (purjee = purchase order ticket) system. Our study identifies the key motives (monetary and non-monetary) of users' (sugarcane growers) acceptance of the e-purjee system based on an economic analysis and face-to-face interviews with rural sugarcane growers. Throughout the article, we will use both the term acceptance and adoption. The e-purjee system, like many development initiatives, was adopted because of government mandate and investment.

Nevertheless, if users do not accept such a system, they will find workarounds and ways to make the mandated system fail, such that eventually it is abandoned (Heeks, 2003; Pade, et al., 2006; Islam & Grönlund, 2007). Hence, user acceptance of the system implies an adoption not because of mandates, but because of personal preference, or positive user attitudes towards using the system (Davis, 1989).

ICT in Bangladesh's Agriculture

With an aim to build 'Digital Bangladesh' by the year of 2021, the Prime Minister's Office of the Bangladesh Government together with the United Nations Development Programme (UNDP) jointly initiated an Access to Information program to implement ICT-based services in different sectors prioritizing agribusiness, health, local government and education. Considering Bangladesh's relatively weak IT infrastructure and low IT literacy, as well as the failure of prior web-based services such as the Agricultural Market Information Systems (Islam & Grönlund, 2010) vis-à-vis the high mobile phone subscription rate, the Government launched mobile-based services to ensure rural users' access to ICT applications. Among them, a digital system for procurement of sugarcane by the Bangladesh Food and Sugar Industries Corporation was one of the prime initiatives. The digital procurement system, popularly known as 'e-purjee' is a mobile-based system that sends an electronic purchase order from sugar mills to the sugarcane growers during the crushing period in the form of Short Message Service (SMS). The SMS-based system replaces a traditional paper-based system (paper purjees), where purchase orders are delivered by growers' hand-to-hand or by a Cane Development Assistant (CDA) working for the local sugar mill. The e-purjee system was expected to extend economic gains on both the demand and supply side, by stabilizing the raw sugarcane flow to mills during the production period, and by enabling a faster, timelier, less costly, and more reliable purchase order distribution to growers. After a successful pilot phase in two sugar mills in 2009, the project was extended to all other Bangladesh sugar mills (13) in 2010.

Digital versus Paper-based Procurement System

The digital procurement system (e-purjee) is an SMS-based purchase order system that sends text messages to growers' mobile phones. Each electronic purjee is an authorization to supply a specific amount (usually 1,200kg or 2,640lb) of raw sugarcane to a particular mill at a predefined

date. To ensure smooth raw materials flows, the sugar mill authority collects and uploads the contact and farming information of local growers in a roster, and sends growers e-purjees following a pre-determined schedule. Prior to purjee notification, growers need to register their mobile phone with the system. Those without a phone can register a neighbor's or relative's phone. To allow growers' to better plan for their harvest and transport the raw materials to sales center in a timely manner, e-purjees are sent about three to four days prior to the scheduled delivery.

In the traditional paper-based system, a paper purjee was sent by growers' 'hand-to-hand' (handed from grower to grower) or by government dispatched Cane Development Assistants (CDAs). Due to the small number of available CDAs compared to the number of growers to be notified, the purjee delivery was often delayed or failed altogether, requiring growers to visit the nearest sales center in person to collect their purjees. When purjee delivery was delayed, growers had to rush the harvest and transportation, as purjees frequently arrived only a day or two prior to the date the sugarcane was due at the mill. Sometimes purjees were lost altogether, or handed over to a non-eligible grower instead, since paper purjees did not contain growers' names. These uncertainties affected both the sugar mill and growers. Growers, who had harvested their sugarcane in anticipation of receiving the purjee before the due date, faced a possible loss or shrinkage of their harvest, whereas the sugar mill operated below scheduled capacity or had to process lower quality (fermenting) raw material.

Objectives of the Study

Already prior to our study, the benefits brought by the digital procurement to both supply-side (growers) and demand-side (sugar mills) have been well recognized (e.g., The Daily Star, October 1, 2011). The sugar mills authority has obtained benefits by ensuring a steady flow of raw materials during crushing season, improving inventory management and enabling quick and direct communication with the growers. Most importantly, sugar mills are now able to crush fresh sugarcane typically within 24 hours of harvesting, resulting a 7.5% increase in sugar recovery (The NewsToday, 2011). In addition, the digital procurement system increases growers' economic gains by about 4% over the paper-based system (Alam & Wagner, 2013), as well as creating non-monetary benefits that may impact growers' decisions to accept the e-purjee

system. Taking these findings as a starting point, this study formulates the following research questions guide the remainder of this article.

1. What are the key motivational drivers (monetary and non-monetary) in the adoption (acceptance) of ICT for rural agribusiness (here, e-purjee in Bangladesh)?
2. What is the relative significance of monetary vs. non-monetary benefits of e-purjee adoption?
3. Are preferences uniform or do they differ based on adopter demographics?

In that next section, the paper introduces prior research on ICT impact on rural agribusiness, particularly in the context of developing countries, and describes the theoretical lens used in this study, while the method of investigating the research questions and the key findings is reported and discussed in Section 3. Section 4 summarizes the findings and provides conclusions.

This study deviates from recent research on technology adoption by setting aside well-known conceptual frameworks such as the Technology Acceptance Model (Davis, 1989), and the Diffusion of Innovations Model (Rogers, 1995). We do this purposely, in an attempt to go beyond exploring whether for instance ease of use or usefulness of the e-purjee system leads to acceptance, but to determine specific key drivers for user acceptance at a more fine-grained level.

RESEARCH BACKGROUND

ICTs and their Impact on Agribusiness

In the agribusiness, traditionally small-scale farmers depend more on intermediaries than on direct selling to buyers, even if it tends to be economically counterproductive (Chowdhury, 2002, p.2). Access to pricing information on alternative market outlets enables small-scale farmers to respond to market opportunities (Muto & Yamano, 2009; Labonne & Chase, 2009) and thus ensures fair pricing of their produce, thus reducing the relevance of intermediaries. ICT-based pricing information systems can build a closer link between sellers and buyers, by removing or minimizing the negative impact of intermediaries on margins, and by enabling farmers to choose the most profitable sales channels. Research shows that ICT can greatly reduce information search costs, which typically account for a major portion of transaction costs in rural business (Silva & Ratnadiwakara, 2008). Furthermore, farmers without connectivity are more likely

deprived of sensitive farming information (e.g. weather or farm management), resulting in reduced crop yields, lower selling prices and thus, reduced income (Lwoga, 2010). Despite the importance of ICT in reducing market inequalities, the adoption of ICT particularly web-based services by rural users has been quite unsatisfactory, largely due to a weak IT infrastructure and low IT literacy in developing countries. As its consequence, many web-based projects in developing countries either failed or achieved less attention from potential users, as was the case with Bangladesh's Agricultural Market Information Service (Islam & Grönlund, 2007) and the Warana Wired Village Project in India (Veeraraghavan, et al. 2009). In contrast, with the introduction of low cost mobile phone and improvement of telecommunication technology, new potentialities have emerged in the sector of rural development as well as agribusiness. Ubiquitous technology such as mobile phones, can greatly aid in economic growth and good governance and thus, in the development process, by creating more opportunities for the rural population (Hudson, 2006). Table 1 provides a summary of prior research concerning the impact of ICT on agribusiness.

Table 1 Impact of ICT adoption in rural agribusiness

Authors	Context	Findings
Jensen, 2007	Mobile phone impact on market performance of fishermen, India	Fishermen's profit increased by 8%
Aker, 2008	Cell phone impact on grain market, Niger	Grain price dispersion across markets reduced by 6.4%
Muto & Yamano, 2009	Impact of mobile phone coverage on market participation, Uganda	Small-scale farmers' participation increased in local markets
Silva & Ratnadiwakara, 2008	ICT impact on transaction cost of vegetable growers, Sri Lanka	Information search cost reduced substantially
Salia et al. 2011	Impact of mobile telephony to overcome market inefficiencies, Ghana	Price variations across markets reduced; and direct selling increased
Alam & Wagner, 2013	Impact of digital procurement system for sugarcane growers, Bangladesh	Growers' economic losses reduced by 4%

The impact of ICT on small-scale farmers' market efficiency and livelihoods has been repeatedly documented (Salia et al., 2011). The adoption of mobile ICT successfully reduced cross-market price dispersion and increased profit of fishermen in Kerala, India by 8% (Jensen, 2007). In

Niger, cell phone adoption reduced the grain price dispersion by 6.4% and intra-annual price variation by 12% (Aker, 2008). Sugarcane growers in Bangladesh increased their economic returns by 4% after switching from a manual paper-based procurement order system to a mobile phone-based procurement system (Alam and Wagner, 2013). Interestingly, all the economic analyses suggest only single-digit (or at best, low dual digit) percentage monetary gains among adopters. Although the extra-earning is not a trivial sum for a small-scale farmer or for the economy at large, its impact might be overshadowed by the seasonal profit variation farmers face due to climate variation or market conditions, and thus might not be a significant determinant for ICT adoption in rural agribusiness. However, non-monetary benefits such as removal of market inequalities (Muto & Yamano, 2009), procedural fairness and reduction of uncertainty (Alam & Wagner, 2013) in business processes, combined with the economic benefit, together may become the drivers for ICT adoption and its sustained use. The impact of non-monetary benefits and potential trade-offs with economic benefits has yet to be researched in detail.

Multi-Criteria Decision Making

The consideration of multiple factors in people's decision processes requires the use of methodologies that enable their modeling, capture, and aggregation. One such methodology is Multi-Criteria Decision Making (MCDM). MCDM enables efficient and transparent decision making based on multiple, often competing criteria (Xu & Yang, 2001). MCDM helps a decision maker in this context to choose the 'best' alternative among those available by structuring the decision-problem on the basis of two or more criteria or attributes (Dyer, et al. 1992). The best alternative is then the one that most closely fits the decision makers expressed or demonstrated preferences.

MCDM methods can be classified into two groups, non-compensatory and compensatory (e.g., Hwang & Yoon, 1981). Non-compensatory methods do not permit trade-offs between attributes, such that an unfavorable value in one attribute cannot be offset by a favorable value in other attribute. In compensatory methods, a moderate decline in one attribute can be compensated by some enhancement in other attributes (Xu & Yang, 2001). Most decision problems in fact include both conditions, as decisions will include constraints (non-compensatory), and objectives (compensatory). To choose an alternative involving multiple conflicting criteria, the decision

maker is asked to provide answers to questions concerning his or her preferences, and on the trade-offs between the preferences, in an iterative process (Zionts & Wallenius, 1976).

To apply the MCDM technique to a given problem, typically a salient subset of all criteria is selected. Thereupon relative weights (trade-offs) are determined (e.g., through “swing weights”) for each criterion, and then each alternative is measured as to its utility for every given criterion. With all criterion utilities known for all alternatives, together with the relative weights for each criterion, overall utilities for each alternative can be determined and the best alternative can be chosen, according to the decision maker’s preferences. In practice, the process is far less clear-cut as described, as decision makers frequently have difficulty in expressing their preferences, have unstable preferences, may not have evaluated each alternative carefully (Weber, 1987, p.44), and may ultimately not use compensatory methods, but instead choose according to their most important criterion (Xu & Yang, 2001, p.6).

There are several well known adaptations of multi-criteria decision making to technology acceptance, one of them is the Technology Acceptance Model (TAM), which is based on the Theory of Reasoned Action (Fishbein & Ajzen, 1975). TAM identifies several criteria as drivers for adoption, in particular for instance ease of use and usefulness of the new technology. We chose not to use TAM (Davis, 1989) or the Diffusion of Innovations (Rogers, 1995) model to guide this research despite their applicability, so as to allow for a more fine grained exploration of drivers of adoption, which could also be better contextualized within the environment, here rural agribusiness in Bangladesh.

APPLICATION OF MCDM TO THE E-PURJEE PROBLEM

To better understand the multi-faceted problem of ICT adoption in rural Bangladesh and to explore a possible compensation between monetary and non-monetary benefits, we sought to apply MCDM to the sugarcane growers’ assessment of benefits provided by the e-purjee system vs. the traditional purjee system. We already possessed the economic data concerning monetary benefits of e-purjees. To obtain information about other (non-monetary) criteria and their relative weight one would ideally want to carry out a large-scale survey of the community at large. This, however, is infeasible given the lack of accessibility of rural sugarcane growers and the relative difficulty involved in preference elicitation. Thus, we chose to carry out face-to-face interviews

with registered users of the e-purjee system. To do so, we first selected one of the sugarcane growing regions of Bangladesh, and with the help of a local sugar mill office, selected eight sugarcane growers from different places of two-neighboring districts (Jhenidah and Jessore) based on their availability during the data collection period. Using a semi-structured interview protocol, the first author conducted interviews in local language (Bangla), each of which lasted approximately 30 minutes. Interviewees were rewarded for their participation through a mobile phone ‘top-up’ (recharge) voucher worth 100 BDT (≈ 1.28 USD), equivalent to two hours’ wages for a rural worker. Interviewees’ demographics covered a range of ages, education levels and farm sizes (Table 2). Important for us was particularly a difference in farm sizes, i.e., small (< 2.5 ha) and large (> 5 ha). Table 2 arranges respondents in ascending order by farm size.

Table 2 Demographic characteristics of the respondents

Sl. No.	Age (yrs)	Education (yrs)	Farming experience (yrs)	Farm size (hac.)
1	42	8	23	0.40
2	52	12	20	0.80
3	45	10	27	1.61
4	42	8	23	2.00
5	33	16	20	2.23
6	52	16	20	5.26
7	55	12	32	5.66
8	55	8	10	7.68
Mean	47	11.25	21.88	3.21
Std.	7.82	3.37	6.36	2.64

On average, respondent age was 47, with almost 22 years of farming experience, and slightly more than 11 years of education (i.e., high school level). The considerable average age reflects the fact that in Bangladeshi families the head of a household, is considered the owner of his farm and thus is the registered user with the e-purjee system.

Identification of Motivational Drivers

The first research question was directed at identifying motivational drivers of e-purjee adoption (acceptance). Subjects responded to an interviewer's question with free-form answers. To organize responses and identify patterns among them, we adopted methods from *Thematic Analysis* (Boyatzis, 1998; Barun & Clarke, 2006), The aim of employing *Thematic Analysis* was to find the ‘key message’ (i.e. codes) within the interview data concerning the research question

(Coffey & Atkinson, 1996, p.27). Following the guidelines of theme development (see, Barun & Clarke, 2006) we identified 9 codes, which were later categorized based on their commonalities to form an overarching theme. Overall, informants mentioned only three distinct themes as motivational drivers in connection with the e-purjee system: (1) fairness, (2) uncertainty reduction, and (3) reduced information search costs.

Table 3 Final thematic map, showing three main themes

Topic	Themes	Codes
Motivational drivers of e-purjee acceptance	Fairness	Fair purjee distribution
		Transparency in purjee distribution
		Decreased the purjee lost incidents
		Reduced the chances of purjee handover
	Uncertainty Reduction	Better plan for harvest and transportation
		Confident in receiving purjee
		Timely purjee collection
	Reduced Information Search Costs	Travel cost saved
		Travel time saved

Drivers of E-purjee Acceptance and Their Significance

After solicitation of respondents' demographic data and motives for e-purjee acceptance, respondents were asked to assess the significance of each driver to their business. A scale of 0-10, with '0' indicating 'very little significance' and '10' indicating 'very high significance' was used. Responses are summarized in Table 4. All interviewees identified fairness. Seven respondents considered it most significant (tied with uncertainty reduction for two interviewees). One interviewee considered it second most significant. Uncertainty reduction was the second most mentioned driver (four mentions) and considered most significant by two interviewees (tied with fairness), as well as second most important by another two respondents. Finally, reduced information search cost was the third most mentioned driver (only one mention), and ranked most significant by one interviewee. Surprisingly, outside of search cost reduction, mentioned by one interviewee, there was no other mention of economic benefits. In other words, subjects significantly discounted economic benefits in their assessment. When subject 5 mentioned cost

reduction, he did not refer to loss avoidance based on shrinkage or lost crops, but only to search costs. The responses thus provide answers to our first research question (and a partial answer to the second one), namely that fairness and uncertainty reduction are key motivational drivers for e-purjee acceptance. Sugarcane growers' sentiments are illustrated for instance by a response from Respondent 3 who mentions,

“The new system allows me to plan better for harvesting and transporting the raw sugarcane to the mill. I’m notified about my delivery in advance. Therefore, I have less concern about the purjee distribution”. (Respondent 3)

The answer reflects both fairness considerations (“... less concern about the e-purjee distribution”) and uncertainty reduction (“... allows me to better plan”).

Table 4 Key motives of e-purjee acceptance and their significance to business

Motives (significance shown in parentheses)	1	2	3	4	5	6	7	8
Fairness	√(10)	√(10)	√(8)	√(10)	√(8)	√(5)	√(6)	√(5)
Uncertainty reduction	√(10)		√(5)	√(7)				√(5)
Reduced information search cost					√(10)			

Economic Gains Resulting from e-Purjee Adoption

In addition to the inquiry about motivational drivers, a follow-up question specifically asked respondents whether they perceived any monetary gains from e-purjee adoption. In case of a positive answer, they needed to state the significance to their business. Four of the eight respondents positively acknowledged the e-purjee system in terms of monetary gains, yet only one respondent (Respondent 5) perceived the gains as significant to his business. The other respondents either failed to assign any significant value or expressed that the extra earnings did not significantly influence their business. The free-form verbal responses clarified that growers either did not clearly recognize the monetary benefit of e-purjee adoption, or that they were not interested in calculating the value. One respondent explained,

“After the introduction of e-purjee I have made significantly fewer visit to the sales centre for the collection of purjee. This certainly cuts down my

transportation cost and saves my farming time. However, I never estimate the cost that I save from the adoption". (Respondent 2)

Although all but one respondent reported no significant monetary gain from e-purjee adoption, in a follow-up discussion most stated their ability to reduce cane weight loss compared to the old paper-based system, as a result of reduced delays between sugarcane harvesting and crushing. One grower replied,

"..in the past, we often faced losses from the shrinkage of sugarcane due to delay in milling, however, the digital procurement system improves the situation dramatically. Now I don't have any worries about the weight loss". (Respondent 4)

The responses to the earlier question about motivational drivers and this question about monetary gains clearly indicate the relative insignificance of monetary considerations in relation to the e-purjee system. This somewhat unexpected finding is likely due to the relative variability of farming incomes that drowns out small improvements. For example, Chaudhuri & Paxson (2002) identified monthly income variability for farmers in India of +2 to -1 multiples of the mean monthly income, whereas Wik (1999) reports year-to-year profit differences for rural farmers at the level of +2.5 to -1.25 multiples of the annual mean. In other words, farmers in the region (a decade earlier) faced significant income uncertainty, measured in multiples, not single digit percentage changes. Clearly then, small economic gains would be of little importance or not even noticed. However, reduction in the variance of income should be highly welcomed, as interviewee responses reflect.

Trade-off: Monetary Motives vs. Non-monetary Motives

When interviewees were asked to trade-off monetary against non-monetary considerations by using swing weights, another interesting outcome emerged. Essentially, growers did not want to explore trade-offs. The swing weight technique requires the comparison along two attributes, and the expression of how much increase in one attribute would have to be achieved to compensate for the decrease in the other. When subjects were asked how much fairness or uncertainty they were willing to give up to achieve more monetary benefit, they refused to do so.

The results were particularly interesting with respect to fairness and money. Apparently, respondents either were reluctant to state their preference for monetary gain at the price of a less fair system, or they perceived the question as too sensitive. Corruption is perceived quite negatively in Bangladesh, and people known to be involved in corruption are disrespected by society. As a result, we found the tendency to answer the fairness question in a manner that seems to be socially accepted. Even a big grower (Respondent 6) who perceived the fairness advantage of the e-purjee system as less important to his business, expressed his preference in favor of a fair system. However, a small farmer, asked for how much unfairness he would accept in return for 60% additional economic benefit, was much more outspoken about the counter-productivity of an unfair system,

“Even though I will have a chance to earn 60% extra, I would rather prefer a fair system for others (big farmers) may earn more than me from an unfair system. That’s why I prefer a 100% fair system where everyone has an equal chance to earn” (Respondent 1)

Of course, another possible reason for the respondents’ reluctance to state any preferences as trade-offs may have been their difficulty to understand the conceptual grounding of the swing weight elicitation mechanism. According to the *Analogy/Association Hypothesis* (Yu & Chen, 2010) of *Brain and Mind Operation*, people try to establish a relationship between their past knowledge and a new situation they face, and once the right relationship has been established, the past knowledge is automatically brought to bear on the interpretation and understanding of the new situation. Our scenarios, however, which required the willingness and ability to treat fairness, uncertainty, and monetary benefits as controllable quantities, and to actively trade between them, must have been quite alien to the respondents, as must have been the assessment of preferences. Hence growers were likely cognitively overloaded in analyzing the trade-offs between the alternatives, and so relied on simple heuristics and the dominance of one criterion in their decision making.

Different Perspectives of Fairness: Small vs. Larger Growers

Whereas all growers expressed a preference for a fairer system, they differed on the significance attributed to fairness, as visible in Table 3. Comparing the significance attributed to fairness by

small growers (below 2.5 ha) to that of big growers (>5 ha), we saw fairness ranked as 8 or 10 by small growers, and 5 or 6 by big growers. One of the larger growers commented on the situation as follows,

“...it seems the purjee distribution is more efficient in the new (e-purjee) system than in the old system (paper-purjee), however, it does not have that much importance to my business. Whatever the system is, I always receive my pujees on time”. (Respondent 6)

This response suggests that larger growers are more immune to the uncertainties and potential unfairnesses of a less transparent and less efficient paper based system. The observation is consistent with prior studies (Muto & Yamano, 2009; Hudson, 2006) which show that small-scale farmers are more deprived from the market and information inequality and ICT can benefit them by creating more equal opportunities. Since the introduction of e-purjee successfully reduces corruption and ensures more transparency, small-scale farmers are now more confident in the purjee distribution process and thus perceive the system as more fair and more desirable. In fact, despite the small sample size of only eight responses, differences in the perceived importance of fairness were highly significant ($t = 6.526, p < 0.001$).

The growers' preference for the e-purjee system is also consistent with the notion of Prospect Theory (Tversky & Kahneman, 1979), which implies that people perceive the impact of losses multiple times stronger than the impact of equivalent gains (cf. Martins & Monroe, 1994), thus leading to loss aversion. Growers' appreciation of the improved procedural fairness and uncertainty reduction of the e-purjee system may be a result of the ability to avoid losses or potential losses and would account for much more utility payoff than small economic gains.

Additional Facilitators of e-Purjee Adoption

To assure that our focus on monetary and non-monetary benefits of the system did not ignore any important criteria that would affect the use of the e-purjee system, we also asked whether there were any other factors that facilitated e-purjee acceptance. Since recently a web-based e-purjee system has become available, we posed this question also with the intention to identify any potential technology drivers and preferences concerning web vs. mobile technology. As expected based on prior research findings (Veeraraghavan, et al. 2009; Islam & Grönlund, 2010), all

respondents preferred the mobile e-purjee delivery against the web version. The low cost of mobile phones and their ubiquity were perceived as the most important technology related features of mobile-based e-purjee acceptance. One respondent said,

“Now, we almost all have mobile phones, The device is cheap and the service charge is fair. Moreover, we can be notified about the delivery wherever we are. It’s easy and fast.” (Respondent 5)

Interviewees’ responses thus suggest that to design, implement and ensure acceptance by potential users, future ICT-led initiatives should consider local contextual factors, such as local technological capabilities (Odedra-Straub, 1993), human resource capacity (Avgerou, 2008), and local practices (Avgerou, 2002; Bada, 2002).

SUMMARY AND CONCLUSION

Our research sought to identify the key motivational drivers (monetary and non-monetary) of a mobile phone based procurement system for sugarcane growers in rural Bangladesh. Employing a multi-criteria based decision making approach, and relying on semi-structured interviews to determine respondent preferences and trade-offs between them, we generated several findings that should help understand the acceptance of ICT based innovations in developing countries, as well as the use of decision analytic techniques in the field.

Consistent with prior assumptions, we learned that non-monetary motives, namely procedural and distributional fairness as well as uncertainty reduction in purjee distribution are most important to the rural community, especially for small-scale growers. Interviews also revealed that many users are not aware of the monetary benefits of ICT use, or that they simply do not translate time savings, information search cost reduction, or less harvest shrinkage into monetary benefits. Future research may wish to further explore the importance of non-monetary benefits, which may differ based on country conditions, financial parameters, information availability and governance. We draw special emphasis on the issue of fairness. Fairness, although identified by all respondents, was highly important only to small farmers. Prior research and interviewees’ responses suggest that large growers have better coping mechanisms to deal with unfairness, or possibly reap different better outcomes under an unfair system. As the e-purjee system provides benefits for small and large growers, this was not a hindrance. Elsewhere, where new technology

may shift the balance in favor of a previously less privileged group by taking away benefits from a previously more privileged group, the resistance to system acceptance may be considerably higher.

Noteworthy was also the feedback on technology use. System acceptance was clearly benefited by use of appropriate technology, namely notification via text message. The system leveraged the available mobile phone infrastructure, thus offering “good enough” communication at low cost, and ubiquity.

Despite the relatively small size of the data set, and respondents’ unwillingness to let us establish a clear-cut trade-off value between monetary and non-monetary motives, we believe that our findings provide initial insights of benefit for both practice and theory. The findings may be useful for the investors such as the Bangladesh Food and Sugar Industries Corporation, the Access to Information Programme, and the UNDP, informing future policy decision making and providing guidance on how to promote more mobile-based ICT solutions for rural users. From a theory perspective, our study may be most valuable in its consideration of factors that deviate from the criteria offered by diffusion of innovation or technology acceptance models. Our study, by focusing on more fine-grained and context-specific adoption criteria, may help the development of theories that offer increasingly more predictive power.

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