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Keng SIAU

Singapore Management University, klsiau@smu.edu.sg

Hong SHENG

Fiona Fui-hoon NAH

Singapore Management University, fionanah@smu.edu.sg

Sidney A. DAVIS

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A qualitative investigation on consumer trust in mobile commerce

Keng Siau*, Hong Sheng and Fiona Nah

College of Business Administration,
University of Nebraska-Lincoln,
Lincoln, NE 68588-0491, USA
Fax: 402 472 5855 E-mail: ksiau@unlnotes.unl.edu
E-mail: hsheng@unlnotes.unl.edu E-mail: fnah@unlnotes.unl.edu
*Corresponding author

Sid Davis

College of Information Science and Technology,
University of Nebraska-Omaha, Omaha, NE 68182-0392, USA
Fax: 402 554 3400 E-mail: sidneydavis@mail.unomaha.edu

Abstract: Mobile commerce represents a significant development in e-commerce, offering accessibility, ubiquity, mobility, and localisation to users. Despite the potential of mobile commerce, trust is a major obstacle in its adoption and development. Many consumers feel uncomfortable with the idea of conducting commerce over wireless, hand-held devices. The focus of this research is to understand trust in mobile commerce and to identify factors that are important for trust development. The research builds on Siau and Shen's framework which depicts two key factors influencing trust in mobile commerce. This research not only validates and expands on the existing framework, but also provides an expanded conceptual model for future research.

Keywords: mobile commerce; trust; e-commerce; empirical study.

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Biographical notes: Keng Siau is an Associate Professor of Management Information Systems at the University of Nebraska-Lincoln. He is Editor-in-Chief of *Journal of Database Management*. He received his PhD degree in 1996 from the University of British Columbia where he majored in Management Information Systems and minored in Cognitive Psychology. His master and bachelor degrees are in Computer and Information Sciences from the National University of Singapore. He is the author of over 60 refereed journal papers in such journals as *Management Information Systems Quarterly*, *Communications of the ACM*, *IEEE Computer*, *Information Systems*, *DATABASE*, *IEEE Transactions on Systems, Man, and Cybernetics*, *IEEE Transactions on Information Technology in Biomedicine*, and *Journal of Information Technology*.

Hong Sheng is a PhD student in Management Information Systems at the University of Nebraska-Lincoln. She received her Bachelor of Science degree from the Shanghai JiaoTong University in 1999 and her Masters degree from the University of Nebraska-Lincoln in 2003. Her current research interests are mobile commerce and ERP.

Fiona Fui-Hoon Nah is an Associate Professor of Management Information Systems at the University of Nebraska-Lincoln. She received her PhD in Management Information Systems from the University of British Columbia. She has published in such journals as *Communications of the ACM*, *Journal of AIS*, *Communications of AIS*, *Journal of Computer Information Systems*, *Journal of Information Technology*, and *Journal of Electronic Commerce Research*. She serves on the editorial board of seven major journals. Her research interests include human-computer interaction, enterprise resource planning, individual and group decision-making, and theory building in information systems research.

Sid Davis is an Associate Professor in the Department of Information Systems and Quantitative Analysis in the College of Information Science and Technology at the University of Nebraska at Omaha. He holds a PhD in Management Information Systems from Indiana University. His research interests include human-computer interaction, distributed work group computing, electronic/mobile commerce, and software training. He has published in journals such as *MIS Quarterly*, *International Journal of Human Computer Studies*, *Information Systems Journal*, and *Communications of the ACM*, and currently serves as an associate editor for *e-Service Journal* and an editorial review board member for *Journal of Database Management*.

1 Introduction

Advances in wireless technology have increased the number of mobile-device users and have stimulated rapid developments in electronic commerce (e-commerce) via the use of these devices. E-commerce transactions conducted through radio-based wireless devices are collectively referred to as mobile commerce (also known as m-commerce and mobile e-commerce). Examples of mobile commerce include mobile banking, mobile stocking and mobile ticketing. Although mobile commerce and e-commerce share many similar features, mobile commerce is inherently different from e-commerce because of its ubiquity, mobility, reachability, and localisation [1,2]. Mobile commerce extends current internet sales channels into more immediate and personalised mobile environments, and is undoubtedly the next wave in e-commerce. It presents consumers with additional opportunities, such as any-time, any-place purchases, wireless coupons based on a user's profile, and automated and unassisted operations. This young industry, however, is confronted with many technological, business, and legal challenges. Many consumers are unfamiliar with the mobile electronic medium, and the idea of conducting business via mobile devices disturbs them. Privacy and security of personal data collected from mobile transactions are major concerns of consumers. Compared to e-commerce, consumers tend to perceive mobile commerce as riskier in nature, feel more vulnerable in using the technology, and are more hesitant to embrace it. To emerge as a viable way of doing business, mobile commerce must overcome these problems of user distrust.

This research examines trust issues in mobile commerce. Employing the Value-Focused Thinking approach [3–6] as an interviewing technique, face-to-face interviews were conducted with current and potential mobile commerce users to identify factors influencing trust in mobile commerce.

The research objectives are:

- to understand the concept of trust in the mobile commerce context
- to build a framework for consumers' trust in mobile commerce
- to provide a conceptual framework for subsequent research on trust.

2 Literature on trust

Trust plays a crucial role in commercial relationships [7,8]. However, the concept of trust is not only convoluted and multi-dimensional, but it also takes on various forms in different contexts, such as contracts, regulation, company policy, personal reputation, and long-established relationships.

According to Bhattacharya et al. [9], the different meanings of trust are reflections of different academic disciplines. Worchel [10] proposed that these different perspectives could be aggregated into three groups:

- *the views of personality theorists* [11]: conceptualising trust as a belief, expectancy, or feeling that is deeply rooted in an individual's personality and has its origins in his/her early psychological development
- *the views of sociologists* [12] *and economists* [13]: conceptualising trust as a phenomenon within and between institutions, and as the trust individuals put in those institutions
- *the views of social psychologists* [14]: characterising trust in terms of the expectation and willingness of the trusting party to engage in a transaction, the risks associated with and acting on such expectations, and the contextual factors that serve to either enhance or inhibit the development and maintenance of the trust that has developed.

In addition to these different approaches, trust has been examined from the marketing perspective, which focuses on two major areas:

- the role of trust in the relationship between dyadic partners involved in transactions [15]
- culture and its influence on the development of trust [16].

As a multi-dimensional concept, trust can be categorised into different types. One type deals with the difference between slow and swift trust [17]. Slow trust is developed gradually over time and is often seen in long-term relationships. Swift trust exists when a relationship develops very quickly and also ceases very quickly. McAllister [18] classified trust into two types: cognitive and affective. Cognitive trust comes from what the trustor considers evidence of trustworthiness – external factors that make the behaviour of the trustee more predictable. Affective trust, according to McAllister [18], is based on emotional bonds between individuals, coming from genuine care and concern

for one another. The trustor's expectations of some level of reliability and dependability (cognitive-based trust) must be satisfied before affective trust can begin to grow.

According to some researchers, trust is developed in stages. For example, Jarvenpaa et al. [19] differentiated between initial trust and mature trust. Mature trust occurs after initial trust and is developed over consistent, satisfactory experiences. Lewicki and Bunker [20] proposed that trust develops in three stages: calculus-based trust, knowledge-based trust, and identification-based trust. Calculus-based trust is a state in which a person determines that he/she simply has more to gain than lose through negotiation and acting in good faith. The second level, 'knowledge-based trust', is grounded substantially in the *predictability* of the other person – getting to know him/her well enough to be able to anticipate behaviour and avoid surprises. In the third level, 'identification-based trust', parties come to understand, appreciate, and even share each other's wants and needs.

Trust is seen to be closely related to risk [21], since without vulnerability to the risk of opportunism, there is no need for trust [22]. Mayer et al. [23] argued that trust is the willingness to assume risk, and trust behaviour is based on the assumption of trust. As Boon and Holmes [24] proposed, the relationship between trust and risk is paradoxical since "to establish a state of trust it is first necessary to take the risk of trusting".

Although trust has been studied in different areas and from different perspectives, all approaches yield some common characteristics [25]. First, it involves two parties: trustor and trustee. Second, risk is unavoidable in the process of trust building. Third, the trustor holds positive belief towards the trustee and is optimistic about the outcomes of the transactions between them. Einwiller et al. [26], for example, defined trust as a means to reduce risk and diminish complexity in a situation involving uncertainty by the trustor (the buyer) having confidence in the trustee (the seller), and therefore expecting that the trustee shows favourable behaviour despite having the possibility to also act unfavourably to the trustor.

Trust is a complex concept. It comprises multiple types and can be developed in multiple stages. Some researchers [27] have argued that it is necessary to integrate the different views of trust across disciplines and suggested that trust may be a 'meso' concept. For example, Kim and Prabhakar [28] proposed the integration of the individual and institutional level views of trust development. Although trust is being studied in separate disciplines, some attempts have been made to integrate the trust literature in these disciplines. In the next two sections, we synthesise prior research and findings related to trust to help provide a foundation for understanding trust in mobile commerce.

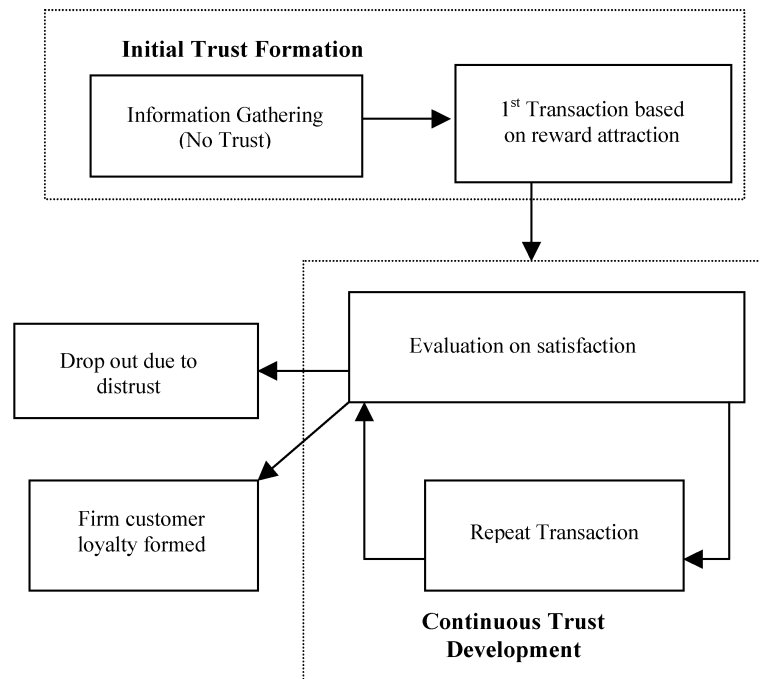
3 Frameworks and models on trust in e-commerce

Mobile commerce and e-commerce share some common antecedents of trust. Hence, it is useful to identify the antecedents of trust in e-commerce to serve as the foundation for this research. Trust, unfortunately, is not something inherent in e-commerce. In fact, consumers do not demonstrate much trust in this method of commerce. Studies showed that 95% of consumers refused to provide personal information to websites at one time or another; 63% of these users refused because they did not trust 'those' behind the web [29].

Several factors contribute to the lack of consumer trust in e-commerce. First, a large number of consumers are not familiar with e-commerce, including the electronic medium itself. Second, the lack of physical access to many e-commerce companies makes consumers perceive online transactions as risky. The lack of elements of personal interaction such as body language, spontaneous reactions of the trading party, and observations of other buyers, as well as the inability to feel, touch, and inspect the desired products, make consumers feel more vulnerable. Third, privacy and security issues still confront much of the e-commerce industry [30,31]. Consumers are concerned about vendors' ability to protect unauthorised access to personal information collected from electronic transactions.

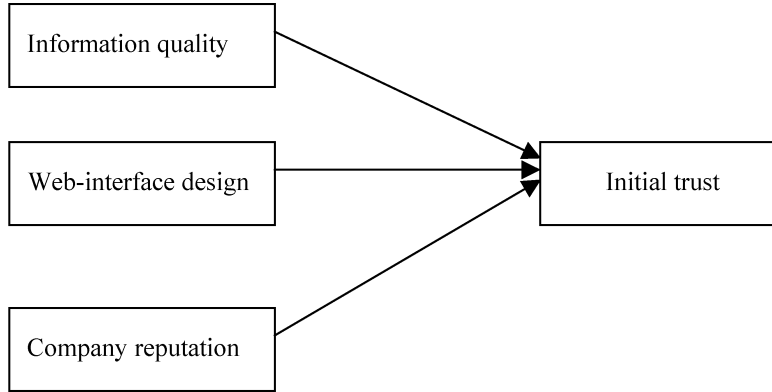
Building consumer trust in e-commerce is a complex and dynamic process. According to Fung and Lee [32], the development of trust is a continuous process (as shown in Figure 1): customers form initial trust through information gathering and via their first satisfactory transaction. Subsequent repeated satisfactory transactions help build continuous trust. Personal experience is the key in continuous trust development because personal experience and the experiences of peers are considered the strongest trust-signal with the highest potential for reducing perceived risk [33].

Figure 1 Trust development life cycle by Fung and Lee [32]



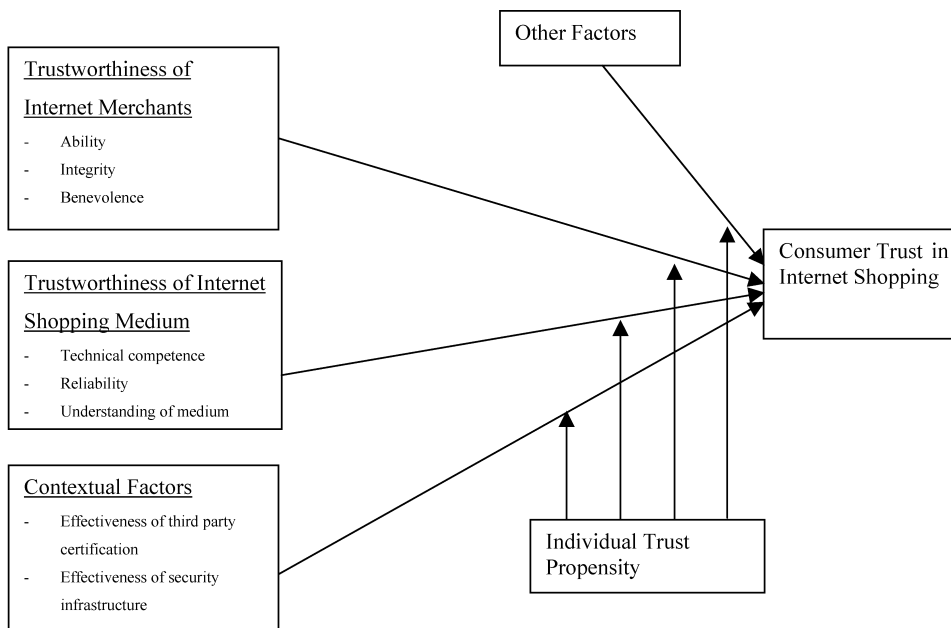
Fung and Lee [32] also introduced a model (see Figure 2) describing the antecedents of initial trust in e-commerce. The three factors influencing initial trust in their model are: information quality (e.g., accuracy, correctness, timeliness, and usefulness), web-interface design (e.g., ease of navigation, quickness of downloads, and reliability), and company reputation (e.g., existing brand name and third party seals of approval).

Figure 2 Antecedents of initial trust by Fung and Lee [32]



According to Lee and Turban [34], there are four main antecedents of consumer trust in e-commerce: trustworthiness of the internet merchant, trustworthiness of the internet as a shopping medium, contextual factors, and other factors (Figure 3).

Figure 3 A proposed model for consumers' trust in internet shopping [34]



Trustworthiness of an internet merchant is influenced by its ability, integrity, and benevolence. It encompasses the concept of ‘reputation’ to some degree. Consumers’ evaluation of vendors’ reputations and sizes affects their trust in web-based vendors, which in turn affects their perceptions of the risk involved in purchasing from the web-based vendor and their attitudes towards the web store [19].

Trustworthiness of the internet shopping medium addresses the primary need for a consumer to interact with a computer system that provides internet shopping. It suggests that the extent to which consumers trust the computerised medium is likely to affect their overall trust in internet shopping. Furthermore, Lee and Turban [34] found that trust in computerised system depends on three sub-factors:

- the perceived technical competence of the internet medium
- the reliability of the internet medium
- the user's understanding of the underlying characteristics and processes of the system.

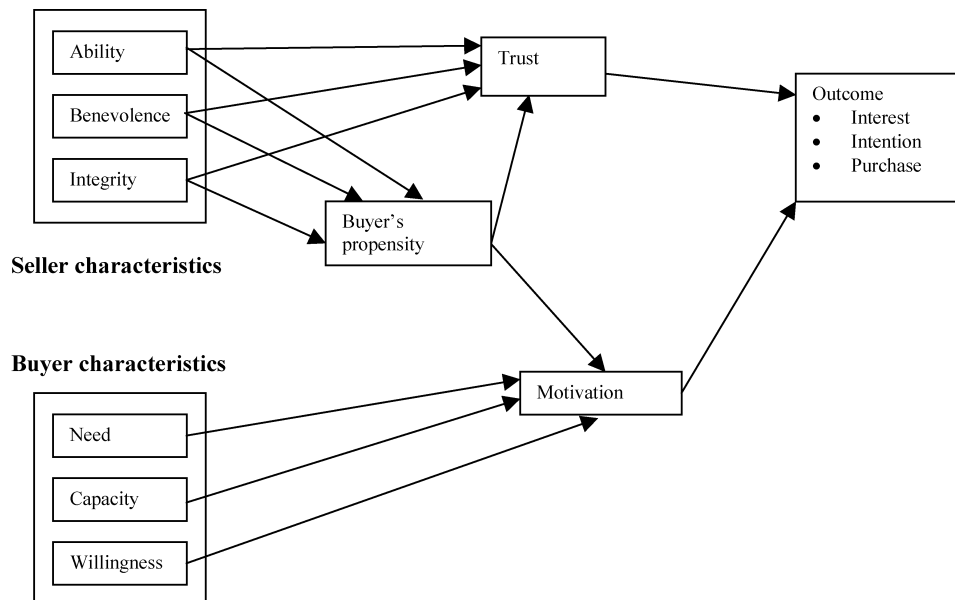
Contextual Factors are concerned with the effectiveness of third party certification and effectiveness of security infrastructures. Security and privacy issues are critical to the success of consumer trust building in internet shopping [29].

Variables that are less coherent, and more likely to be treated as control variables, are included within the category of *other factors* [34]. They include consumer demographic variables such as sex, age, and internet usage experience.

Individual trust propensity moderates these four main constructs of consumer trust in internet shopping. An individual's propensity to trust is the personal characteristic that influences the effect of trustworthiness attributes on the formation of trust [23].

Ambrose and Johnson [35] proposed a model in electronic retailing. Their model (see Figure 4) presents trust in the buying–selling relationship and they argued that buyer's motivation is one of the key factors influencing his/her behaviour. In addition, the buyer's propensity to trust the seller and the seller's capability to be trusted will lead to trust. They argued that the buyer's propensity to trust is not a constant factor and can vary over time depending on the seller's ability, benevolence, and integrity.

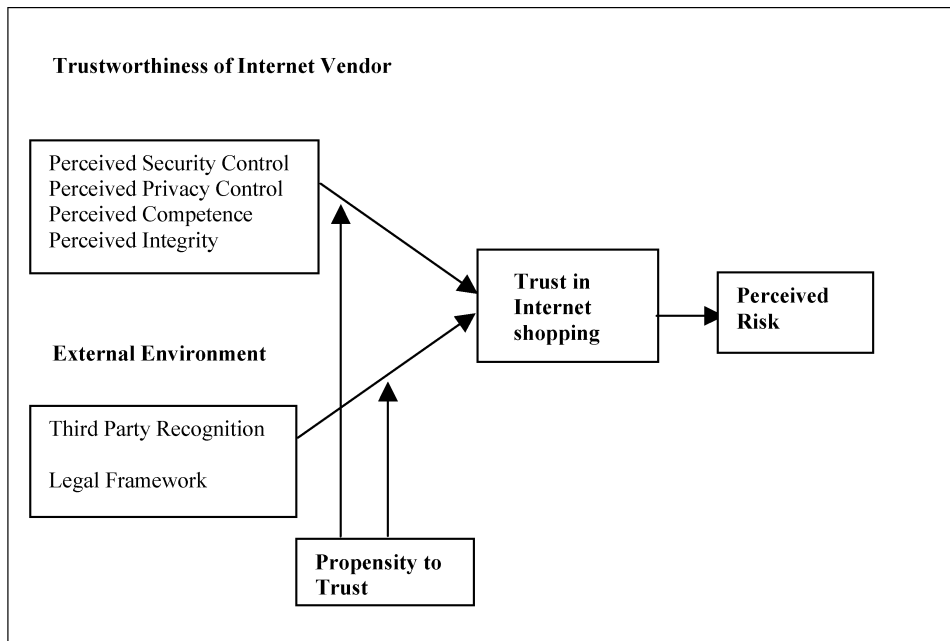
Figure 4 Trust model by Ambrose and Johnson [35]



Cheung and Lee [30] introduced a model (see Figure 5) indicating that the characteristics of the internet vendor and the external environment influence trust in internet shopping, which in turn reduces perceived risk. The perceived trustworthiness of a party is often suggested as an important antecedent of trust. There has been a stream of research examining the influence of perceived trustworthiness on trust. Mayer et al. [23] found that three factors – ability, integrity, and benevolence – are consistently related to trust. In addition, Cheung and Lee [30] included two new factors to reflect the specific nature of internet shopping: Perceived Security Control and Perceived Privacy Control.

External environment in the model refers to third-party recognition and legal framework. According to Cheung and Lee [30], propensity to trust is a stable within-party factor that affects the likelihood of the party to trust others. People with different cultural backgrounds, personality types, and developmental experiences vary in their propensity to trust [36]. This propensity to trust is viewed as a personality trait that leads to a generalised expectation about the trustworthiness of others. Perceived risk is used to explain the consumer's behaviour and it is obvious that perceived risk is higher in internet shopping compared to traditional ('brick and mortar') shopping.

Figure 5 A conceptual model of trust in internet shopping by Cheung and Lee [30]



In addition to the trust models presented above, there are other trust related research works that have studied the antecedents of trust in e-commerce. For example, Jarvenpaa et al. [19] found that perceived size and reputation of vendor influence consumer trust in e-commerce. McKnight and Chervany's [31] e-commerce trust model encompasses perspectives from Psychology, Sociology and Social Psychology, and relates conceptual level and operational level trust constructs to consumers' e-commerce actions. Kim and Prabhakar [28] proposed that the trustor's propensity-to-trust,

word-of-mouth referrals, and institutional characteristics are key factors influencing consumers' initial trust towards internet banking.

Are all these factors applicable to trust in mobile commerce? Are there new factors relevant to mobile commerce? As an extension of e-commerce, mobile commerce shares some of its characteristics. As such, many of the factors influencing trust building in e-commerce may be applicable to trust building in mobile commerce. However, mobile commerce has some unique features that may influence the development of trust, such as localised personalisation and mobility. Therefore, we expect to find new features that are unique to trust in mobile commerce.

4 Trust framework in mobile commerce

Based on prior literature, Siau and Shen [25] developed a preliminary trust framework (see Figure 6). They suggested that the two main factors influencing trust in mobile commerce are: trust in mobile technology and trust in mobile vendors. Given the current state of mobile technology, they suggested that reliability and security are important for cultivating online trust. As mobile technology evolves, the focus will shift from engendering customer trust in technology to engendering trust in vendors [25]. Some of the main factors that lead to customer trust in mobile commerce are:

Figure 6 Components of customer trust in mobile commerce [25]



- *Usability and ease of use.* A usable and reliable mobile device is the first step in engendering consumer trust in mobile technology. Improving the design of mobile devices and enabling users to perform commercial tasks easily and effectively while keeping mobility and flexibility are two ways to foster trust in using mobile technology.
- *Reliability of mobile infrastructure.* Reliability and security of the technology are necessary for cultivating trust online. Compared with wired networks, wireless communications suffer drawbacks in bandwidth, connection stability, and predictability in functions. Measures, such as digital certificates and private and public keys, help to address consumers' security concerns and to meet security requirements in the mobile environment. There is also the need to establish additional servers to store information, perform security checks, and conduct electronic payments on behalf of mobile devices.

- *Cultivation of interest.* To many consumers, the use of mobile technology to conduct business is still a relatively new concept. Potential buyers need to develop interests in mobile commerce and be convinced that their needs and wants can be fully met in the mobile commerce environment. This can be accomplished through: familiarity (through frequent exposure), maintaining high site quality, and providing attractive rewards.
- *Elicitation of satisfaction.* Trust is fragile, hard to cultivate, and easily lost. Consumer satisfaction is the key in the trust development process. The following aspects are important for consumer satisfaction: good vendor reputation, privacy policy, security controls (e.g., digital signatures and encryption mechanisms), third party recognition and certification (e.g., VeriSign), open and reciprocal communication, and the feeling of belonging to a community.

Although this preliminary framework addresses some of the important issues in building consumer trust in mobile commerce, the framework has not been empirically tested. This research validates and expands the framework through an empirical study.

5 Research methodology

A qualitative approach was adopted in this study. Specifically, interviews were conducted to identify the factors that were considered important to gain consumer trust in mobile commerce. Keeney's Value-Focused Thinking approach [3] was utilised as the interviewing technique to solicit the factors.

Value-focused thinking, which is fundamentally about deciding what is important and how to achieve it, defines essentially what decision makers care about. Value-focused thinking is superior to traditional decision-making approaches, such as the alternative-based approach, because it emphasises decision makers' values as a means to identify and evaluate solution alternatives. When using traditional approaches to decision making, decision makers are often not aware of all of their objectives. Also, because of time constraints and the pressure to provide solutions quickly, these objectives may not have been identified before alternatives are considered or recommendations are made. Value-focused thinking provides a systematic approach for articulating and organising values, which leads to a more complete set of alternative solutions *and* a clearer understanding of how each alternative contributes to the achievement of objectives [3].

The process of Value-Focused Thinking involves three steps:

- develop an initial list of objectives
- express all objectives in a common form
- organise objectives to identify the relationships between them [6].

5.1 Develop an initial list of objectives and convert all objectives into a common form

Values are principles used for this evaluation. They range from ethical principles that must be upheld to guidelines for preferences among choices [3]. Values can be indicated and determined by ethics, desired traits, characteristics of consequences that matter, guidelines for action, priorities, value tradeoffs, and attitudes toward risk.

Values that are of concern are made explicit by the identification of objectives. An objective is a statement of something that one desires to achieve. The objectives for a decision situation should come from individuals interested in and knowledgeable about that situation, and the process of identifying objectives requires significant creativity and hard thinking about a decision situation. There are several useful techniques that can help stimulate the identification of possible objectives [3].

- *A wish list.* When asking a person to express objectives, the interviewer may ask, "If you had no limitations at all, what would your objectives be?" Similarly, he/she may ask what elements constitute the bottom line for the decision situation and for the decision maker [3].
- *Problems and shortcomings.* The interviewer may ask about major problems the respondent has right now or what needs to be changed regarding the status quo.
- *Alternatives.* Existing alternatives are useful sources for objectives. The interviewer can ask about the objectives of each alternative. He/she can also use hypothetical alternatives to elicit more objectives. He can ask the respondent to describe a 'perfect' alternative or a 'terrible' alternative and give an explanation of what makes it perfect or terrible.
- *Consequences.* Consequences are descriptions of the effects of alternatives described in terms of the degree to which objectives are met [3].

All the objectives should be expressed in a common form. The objective is characterised by three features: a decision context, an object, and a direction of preference.

5.2 Organise objectives to identify their relationships

At this stage, there is a long list of objectives. Now, it is necessary to distinguish between *fundamental objectives* and *means objectives*. Fundamental objectives are concerned with "the ends that decision makers value in a specific context", whereas means objectives are "methods to achieve ends" [4].

To establish the relationships between the objectives, we used a test called "Why Is That Important?" For each identified objective, asking the question, "Why Is That Important?", yields two types of possible responses. One is that this objective is one of the essential reasons for interest in the situation. This is called a fundamental objective. The other answer is that an objective is important because it leads to *other* objectives. This is called a means objective. The 'other' objectives that are identified may not be within the current list. Therefore, this process can also create new objectives [3].

By repeatedly asking the question, “Why Is That Important?” for each identified objective, the means objectives and ends objectives become apparent, and their means–ends relationships can be identified.

6 Data collection and procedures

Eighteen subjects were interviewed using the Value-Focused Thinking approach. Ten subjects were male and eight were female. The average age of subjects was approximately 28. Most of them were graduate students from a large Midwestern University in the USA and they typically had 2–5 years of working experience. The subjects were experienced and heavy computer users. All the subjects had experience in e-commerce; most of them had at least two years of e-commerce experience. Five of the subjects were mobile users (meaning that they had experience in using mobile devices). The interviews were conducted face-to-face with each subject individually. Each interview lasted about an hour.

The subjects in this research were not randomly selected. Instead, they were selected using a method called ‘purposive sampling’ – a non-probability sampling approach [37]. Although probability sampling (as opposed to purposive sampling) usually yields a more representative sample of the population, it is not only costly and time-consuming to carry out, but it is also not appropriate for this study, which investigates trust issues concerning an *emerging* technology and application. In our study, we needed subjects who had experience with internet commerce. Hence, we chose our subjects based on the requirement that they needed to have experience with *either* mobile commerce *or* e-commerce. Since we examined trust issues in mobile commerce, the participants had to have some experience or understanding of mobile commerce. Given that mobile commerce is still a relatively new phenomenon that has not been widely adopted, it may not be meaningful to select subjects randomly from a population. Because mobile commerce shares some significant characteristics with e-commerce concerning consumer trust, we believe that experience with e-commerce provides users the basic understanding and appreciation of trust issues in mobile commerce. From our pilot study, we also found that subjects who satisfied our criteria for subject selection also demonstrated a good understanding of mobile commerce, and they described trust as one of the reasons for not adopting it. So, we are confident that the subjects were not only qualified but also appropriate subjects for this study.

All eighteen of our subjects had consumer-based e-commerce experience, and five of them had used mobile devices (e.g., cellular phones or PDAs). Since most of our subjects were e-commerce users who reported that they were likely to adopt mobile commerce in the future, they represented the potential adopters of mobile commerce. Also, we selected subjects across different academic disciplines and from both genders to reduce systematic errors in sampling.

The data collection processes are described as follows:

Step 1: Get the values. Considering that mobile commerce is a new phenomenon and it is still in its infancy stage, we adopted the ‘wish list’ approach from Value-Focused Thinking to elicit the subjects’ initial objectives. By asking questions such as “If there were no limitations, what would your objectives be with regard to achieving trust in mobile commerce?”, we gathered some initial objectives related to trust in mobile

commerce. Once we arrived at an initial list of objectives, we expanded this list by using another interview technique from Value-Focused Thinking – ‘problems and shortcomings’. For example, by asking iteratively, “What would you like to achieve in this decision context?”, the interviewees were prompted to think broadly for possible objectives. After the interview, the list of the objectives identified during the interview was reviewed by the interviewees to make sure that no objectives were omitted, and the interviewer had not misinterpreted the objectives.

Step 2: Convert the objectives into a common form. Following the interviews, the interviewer combined all the objectives from all the participants. Because objectives presented by the interviewees were in various forms, it was necessary to convert them into a common form. According to Keeney [3], an objective is characterised by three features: a decision context, an object, and a direction of preference. For example, some subjects mentioned that ensuring the security of transactions had always been one of their concerns in trusting mobile commerce. So, this can be converted to a statement such as: ‘Enhance security of wireless transaction’. In this objective, transaction is the decision context, and security is the object, and the preference is more security.

Step 3: Identify relationships between objectives. The output of the first two stages was a list of objectives. However, further refinement was needed to clarify the *structure* of the objectives in the decision context. We identified relationships between objectives through the “Why Is That Important” test. As mentioned previously, there are possibly two kinds of answers to this question. One is, “It is important because it is just important”. In this case, this objective is a candidate for fundamental objectives. Alternatively, the answer could be, “It is important because it influences another objective”. So, it was clear that this objective is a means objective. This approach suggests the relationships between objectives.

Step 4: Build framework for trust in mobile commerce. Once we have a list of objectives relating to trust in mobile commerce, we analysed the relationships between them based on the subjects’ interviews and developed a framework for trust in mobile commerce.

7 Results

A few steps were taken to ensure reliability and accuracy of the results. First, to ensure the accuracy of the network, we asked subjects to review the objectives they stated to make sure there were no missing objectives or misinterpretations of objectives.

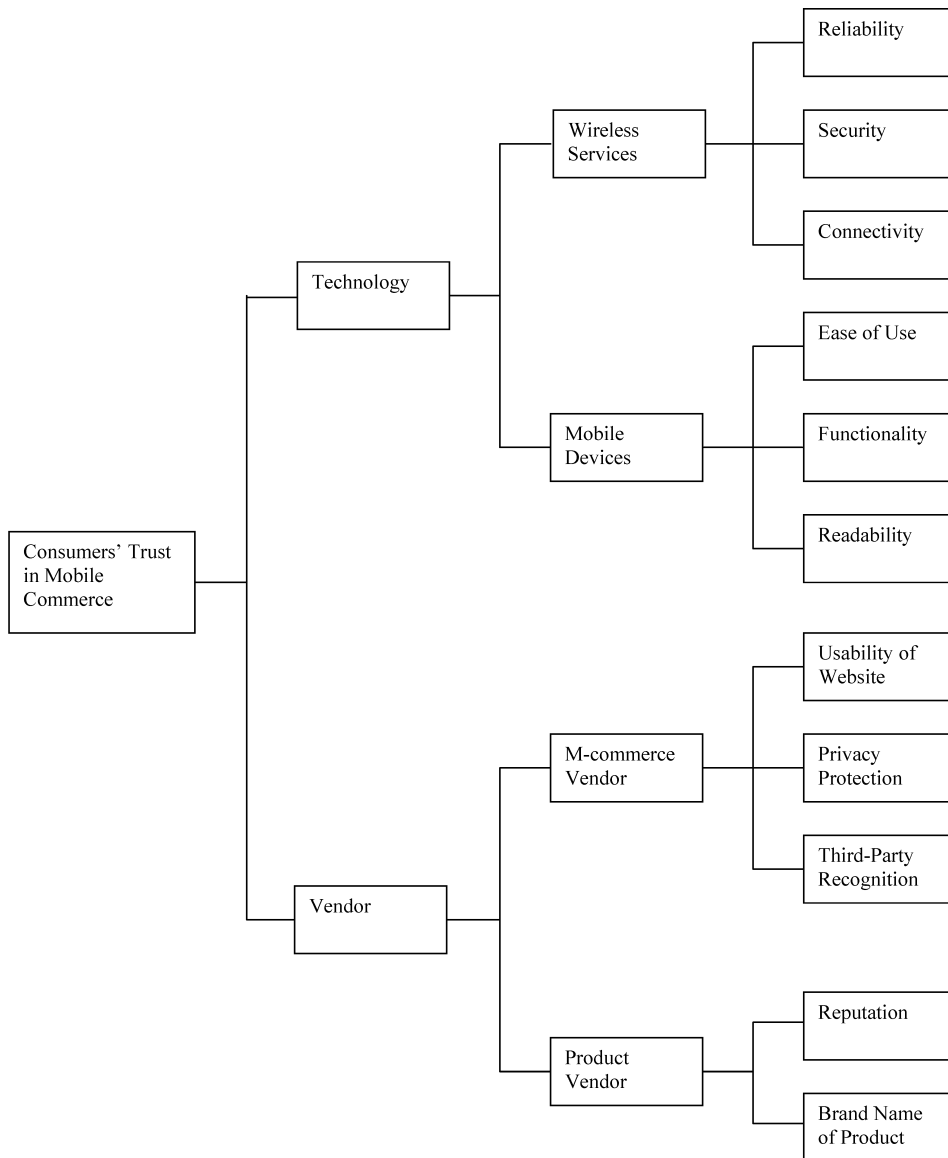
Second, a ‘split-half’ procedure was adopted to validate the framework. In this procedure, nine interview records were randomly selected and a framework was created based on the information derived from these nine interviews. Another framework was created based on the information from the rest of the interviews. Then, the two frameworks were compared and found to be similar to each other. This is not surprising, as the data collection is comprehensive and thorough with each interview lasting about an hour.

Third, we checked to ensure that there was no major difference between mobile device users and non-mobile device users. The results show that the factors identified by the two groups were similar. This is not surprising as mobile commerce was a new

concept when the data was collected in the middle of 2002. So, most people had very limited exposure to mobile commerce and, therefore, had roughly the same ideas on the factors that were important to building trust in mobile commerce.

Fourth, the framework was shown to four of the eighteen subjects in the study. The subjects were asked to validate and comment on the framework. This validation process resulted in only minor changes. The final framework is shown in Figure 7.

Figure 7 Framework for consumer trust in mobile commerce



8 Discussion

Since mobile commerce is still relatively new, and consumers are resistant to trust mobile commerce, understanding the factors influencing trust is very important for both researchers and practitioners.

The framework developed in this research provides a good understanding of the antecedents of trust in mobile commerce from the consumers' point of view. The framework we derived also serves as a validation of Siau and Shen's framework [25] by showing that technology and vendor are the two main components in building consumers' trust in mobile commerce. Our framework further breaks down each component, and suggests that wireless services and mobile devices are the two main factors related to technology. As for the 'vendor' component, consumers are concerned not only with the product vendor that manufactures the product, but also with the m-commerce vendor who sells the product on the website. Our framework also expands Siau and Shen's framework [25] by identifying antecedents of trust under each component.

From the derived framework, we observe that trust in mobile commerce shares some common antecedents with trust in e-commerce. This commonality, as we discussed earlier, is not surprising, as mobile commerce is an extension of e-commerce. For example, in our framework, we found factors such as reputation of vendor, third-party recognition, privacy regulations, and security issues. These factors have been well documented in the e-commerce literature. The framework we derived shows that, as a form of e-commerce, mobile commerce is also plagued by many of the issues and concerns surrounding e-commerce.

It is somewhat surprising that our research results do not capture issues concerning consumer characteristics such as individual propensity to trust and consumer understanding of mobile commerce. We initially expected our subjects to highlight these factors as important issues related to trust in mobile commerce. One possible explanation is that mobile commerce is still in its infancy, and mobile technology is still under development. In the current stage of mobile commerce development, consumers are more concerned with issues concerning vendors and technology. This is in line with Siau and Shen's [25] framework where trust in mobile technology and trust in mobile vendors are the two main components of trust in mobile commerce.

Because of the unique characteristics of mobile commerce, some *differences* exist between trust in e-commerce and mobile commerce. For example, mobile devices are different from desktop or laptop computers in that they have small screens and somewhat cumbersome input and output mechanisms, which impede consumers' trust and adoption of mobile devices.

Our findings contribute to the literature in several ways. First, the results provide us with a more in-depth understanding of trust issues related to mobile commerce. The findings related to trust in mobile commerce reveal that even though mobile commerce is a form of e-commerce, mobile commerce does have unique features and associated technological issues. For example, the limitations of mobile devices (e.g., screen size, keyboard) have an impact on trust in mobile commerce. Second, the framework developed in this research validates and expands the preliminary network proposed by Siau and Shen [25]. Third, our research findings provide a conceptual framework to guide future research on trust in mobile commerce.

In addition to its contribution to academic literature, this research can provide tangible benefits to practitioners. As one of the first empirical studies on trust in mobile commerce, the framework developed in this research highlights the issues that are important to consumers and vital to building trust in mobile commerce. For example, security and privacy are two of the biggest concerns of consumers in embracing mobile commerce. All eighteen subjects raised these two concerns as major issues in adopting mobile commerce. Concrete steps must be taken to assure consumers that security and privacy are guaranteed. Mobile commerce providers should devote more effort not only to improve the security of data transactions, but also to enhance user interface of mobile devices by ensuring ease of use, functionality, and readability. The framework we developed categorises the trust issues into two main components – trust in technology and trust in vendor – and provides detailed factors related to each component. It can serve as a ‘roadmap’ for practitioners to increase consumers’ trust in mobile commerce. Last but not least, the findings in this research can be used to help practitioners formulate their mobile commerce strategies to enhance consumers’ trust in mobile commerce.

9 Conclusions

Mobile commerce presents a new way of doing business and it has much potential [38]. However, to achieve the potential, the trust issues in mobile commerce need to be understood and addressed. The framework developed in this study provides a step in this direction.

A possible extension to this research is to collect data from subjects with substantial mobile commerce experience when mobile commerce is more developed and established. This will enable us to compare the trust factors when mobile commerce is in the infancy stage to the trust factors when mobile commerce is more established. We expect some of the factors that are important in this framework to become less important or less of a concern when mobile technology is more developed.

References

- 1 Siau, K., Lim, E. and Shen, Z. (2001) ‘Mobile commerce – promises, challenges, and research agenda’, *Journal of Database Management*, Vol. 12, No. 3, pp.3–12.
- 2 Siau, K. and Shen, Z. (2002) ‘Mobile commerce applications in supply chain management’, *Journal of Internet Commerce*, Vol. 1, No. 3, pp.3–14.
- 3 Keeney, R.L. (1992) *Value-focused Thinking*, Harvard University Press, Massachusetts, Cambridge.
- 4 Keeney, R.L. (1994) ‘Creativity in decision making with value – focused thinking’, *Sloan Management Review*, Summer, pp.33–41.
- 5 Keeney, R.L. (1999) ‘Developing a foundation for strategy at seagate software’, *Interfaces*, Vol. 29, No. 6, pp.4–15.
- 6 Keeney, R.L. (1999) ‘The value of internet commerce to the customer’, *Management Science*, Vol. 15, No. 4, pp.533–542.
- 7 Morgan, R. and Hunt, S. (1994) ‘The commitment – trust theory of relationship marketing’, *Journal of Marketing*, Vol. 58, pp.20–38.
- 8 Nah, F. and Davis, S. (2002) ‘HCI research issues in electronic commerce’ *Journal of Electronic Commerce Research*, Vol. 3, No. 3, pp.98–113.

- 9 Bhattacharya, R., Devinney, T. and Pillutla, M. (1998) 'A formal model of trust based on outcomes a formal model of trust based on outcomes', *Academy of Management Review*, Vol. 23, No. 3, pp.459–472.
- 10 Worchel, P. (1979) 'Trust and distrust', in Austin, W.G. and Worchel, P. (Eds.): *Psychology of Intergroup Relations*, Brooks/Cole, Monterey, pp.174–187.
- 11 Rotter, J.B. (1967) 'A new scale for the measurement of interpersonal trust', *Journal of Personality*, Vol. 35, No. 4, pp.657–665.
- 12 Lewis, D. and Weigert, A. (1985) 'Trust as a social reality', *Social Forces*, Vol. 63, No. 4, pp.967–985.
- 13 Dasgupta, P. (1988) 'Trust as a commodity', in Gambetta, D. (Ed.): *Trust: Making and Breaking Cooperative Relations*, Basil Blackwell, New York, pp.49–72.
- 14 Deutsch, M. (1958) 'Trust and suspicion', *Journal of Conflict Resolution*, Vol. 2, No. 4, pp.265–279.
- 15 Smith, J.B. and Barclay, W.B. (1997) 'The effects of organizational differences and trust on the effectiveness of selling partner relationships', *Journal of Marketing*, Vol. 51, pp.3–21.
- 16 Doney, P.M., Cannon, J.E. and Mullen, M. (1998) 'Understanding the influence of national culture on the development of trust', *Academy of Management Review*, Vol. 23, No. 3, pp.601–620.
- 17 Meyerson, D., Weick, K.E. and Kramer, R.M. (1996) 'Swift trust and temporary groups', in Kramer, R.M. and Tyler, T.R. (Eds.): *Trust in Organizations: Frontiers of Theory and Research*, Sage, Thousand Oaks, CA, pp.166–195.
- 18 McAllister, D.J. (1995) 'Affect and cognition based trust as a foundation for interpersonal cooperation in organizations', *Academy of Management Review*, Vol. 38, No. 1, pp.24–59.
- 19 Jarvenpaa, S.L., Tractinsky, N., Saarinen, L. and Vitale, M. (1999) 'Consumer trust in an internet store: a cross – culture validation', *Journal of Computer – Mediated Communication*, Vol. 5, No. 2, pp.44–71.
- 20 Lewicki, R.J. and Bunker, B.B. (1996) 'Developing and maintaining trust in working relationships', in Kramer, R.M. and Tyler, T.R. (Eds.): *Trust in Organizations: Frontiers of Theory and Research*, Sage, Thousand Oaks, CA, pp.133–137.
- 21 Lorenz, E.H. (1988) 'Neither friends nor strangers: informal networks of subcontracting', in Diego, G. (Ed.): *Trust: Making and Breaking Cooperative Relationships*, Blackwell, Oxford, pp.194–210.
- 22 Chiles, T.H. and McMackin, J.F. (1996) 'Integrating variable risk preferences, trust, and transaction cost economics', *Academy of Management Review*, Vol. 21, No. 1, pp.73–99.
- 23 Mayer, R.C., Davis, J.H. and Schoorman, F.D. (1995) 'An integrative model of organizational trust', *Academy of Management Review*, Vol. 20, No. 3, pp.709–734.
- 24 Boon, S. and Holmes, J. (1991) 'The dynamics of interpersonal trust: resolving uncertainty in the face of risk', in Hinde, R. and Groebel, J. (Eds.): *Cooperation and Prosocial Behavior*, Cambridge University Press, Cambridge, UK, pp.190–211.
- 25 Siau, K. and Shen, Z. (2003) 'Building consumer trust in mobile commerce', *Communications of the ACM*, Vol. 46, No. 4, pp.91–94.
- 26 Einwiller, S., Geissler, U. and Will, M. (2000) 'Engendering trust in internet businesses using elements of corporate branding', in *Proceedings of America Conference of Information Systems*, pp.733–739.
- 27 Rousseau, D.J., Sitkin, S.B., Burt, R.S. and Camerer, C. (1998) 'Not so different after all: a cross – discipline view of trust', *Academy of Management Review*, Vol. 23, No. 3, pp.393–404.
- 28 Kim, K. and Prabhaker, B. (2000) 'Initial trust, perceived risk, and the adoption of internet banking', in *Proceedings of Twenty First International Conference on Information Systems*, pp.537–543.

- 29 Hoffman D., Novak, T. and Peralta, M. (1999) 'Building customer trust online', *Communications of The ACM*, Vol. 42, No. 4, pp.54–57.
- 30 Cheung, C. and Lee, M. (2000) 'Trust in internet shopping: a proposed model and measurement instrument', *Proceedings of the 2000 America's Conference on Information Systems*, pp.681–689.
- 31 McKnight, D. and Chervany, N. (2001) 'Conceptualizing trust: a typology and e-commerce customer relationships model', *Proceedings of Hawaii International Conference on System Sciences*, p.7022.
- 32 Fung, R. and Lee, M. (1999) 'EC – trust (trust in electronic commerce): exploring the antecedent factors', *Proceedings of America Conference of Information Systems*, pp.517–519.
- 33 Deutsch, M. (1977) *The Resolution of Conflict: Constructive and Destructive Process*, Yale University Press.
- 34 Lee, M.K.O. and Turban, E. (2001) 'A trust model for consumer internet shopping', *International Journal of Electronic Commerce*, Vol. 6, No. 1, pp.75–91.
- 35 Ambrose, P.J. and Johnson, G.J. (1998) 'A trust model of buying behavior in electronic retailing', *Proceedings of American Conference on Information Systems*, pp.263–265.
- 36 Hofstede, G. (1980) *Culture's Consequence: International Differences in Work – Related Values*, Sage, Beverly Hills, CA.
- 37 Cooper, D.R. and Schindler, P.S. (2000) *Business Research Methods*, McGraw-Hill/Irwin Press.
- 38 Nah, F., Siau, K. and Sheng, H. (2004) 'The value of mobile applications: a study on a public utility company', *Communications of the ACM*, forthcoming.