Please quote as: Janson, A.; Hoffmann, A.; Hoffmann, H. & Leimeister, J. M. (2013): How Customers Trust Mobile Marketing Applications. In: International Conference of Information Systems (ICIS), Milano, Italy (accepted for publication).

HOW CUSTOMERS TRUST MOBILE MARKETING APPLICATIONS

Completed Research Paper

Andreas Janson
Kassel University
Information Systems
Pfannkuchstr. 1, 34121 Kassel
Germany
andreas.janson@uni-kassel.de

Axel Hoffmann
Kassel University
Information Systems
Pfannkuchstr. 1, 34121 Kassel
Germany
axel.hoffmann@uni-kassel.de

Holger Hoffmann
Kassel University
Information Systems
Pfannkuchstr. 1, 34121 Kassel
Germany
holger.hoffmann@uni-kassel.de

Jan Marco Leimeister
Kassel University
Information Systems
Pfannkuchstr. 1, 34121 Kassel
Germany
leimeister@uni-kassel.de

Abstract

Smartphone applications for marketing purposes like free advertising games or mobile loyalty programs are becoming increasingly prevalent. Unfortunately, due to recurring news about the excessive use of personal data, many customers consider such applications as suspicious. As a key driver for adoption, organizations try to facilitate customers' perceived trust in the applications. In this paper, we propose a third-order trust model to evaluate the influence of technology-related trust dimensions and determinants. To evaluate their impact, we conducted a free online experiment. Surprisingly, the results of our study show that the process dimension has no significant impact on trust, indicating that users are not concerned with the underlying mechanisms of the IT artifact. Nevertheless, performance and purpose with their corresponding determinants have a significant impact on trust. Thus, by examining technology-related trust determinants for mobile marketing applications, we offer design implications to address users trust in the application development.

Keywords: Trust, Mobile Marketing Applications, Loyalty Programs

Introduction

The recent development and penetration of smartphones has enabled the practical field to use mobile devices for marketing purposes (Bauer et al. 2005). An often applied example is the development of mobile applications to foster customer loyalty by replacing traditional customer cards in order to overcome saturation effects (Goldman 2010; Mann and Prein 2010; Wright and Sparks 1999). These applications are used within (mobile) loyalty programs and provide services such as mobile payment, paperless coupons or a location-based service (LBS).

However, the adoption of such mobile applications for marketing purposes (Mann and Prein 2010; Prein 2011) and associated technologies, such as Near Field Communication (Clark 2012; Resatsch 2010), are often poor. Moreover, the belief of losing control over personal data processed through a complex smartphone is a common topic nowadays (Shilton 2009). Companies are able to track their customers in their daily behavior, create location profiles or just see where else a customer is shopping (Paul et al. 2011). Customers have reservations about this excessive use of personal data (Mann and Prein 2010), and may consider such applications to be suspicious. In consequence, they refuse to download or even use such an IT artifact (Mann and Prein 2010). Hence, concepts are needed which deal with these issues.

To further the adoption and usage of new systems and technologies, the concept of trust has been proven to be useful (Gefen et al. 2003). The mechanism of trust is precipitated by the need of people to understand other people, as well as their surroundings. These surroundings may be uncertain, but trust allows people and also IT users to act in such surroundings by reducing the perceived social complexity (Luhmann 1979). Although trust is considered to be crucial for adoption of mobile marketing applications (Shankar and Balasubramanian 2009), there is a lack of research regarding mobile marketing and trust (Lamarre et al. 2012; Varnali and Toker 2010). Hence, this paper deals with this research gap by studying the formation of trust in mobile marketing applications. The main goal is to derive implications for building trust and overcoming adoption barriers. This paper aims to answer two research questions: 1) Which antecedents determine the customers' trust in a mobile application for marketing purposes? and 2) What is the impact of these specific trust antecedents? The contribution of this study is the development of a trust model for mobile marketing applications to provide design implications for specific mobile loyalty applications by empirically evaluating the impact of technology-related trust antecedents.

The remainder of this paper is structured as follows. First, we provide a brief overview of related work in trust theory and how trust is formed in IT artifacts. Next, the development of a trust model for a mobile application is described. The fourth section shows the research method to evaluate the proposed trust model, after which we report the results of the model. In section 6 we discuss the results, and show implications of our results. In section 7 we highlight possible limitations of our study and call for future research activities, before the paper closes with a conclusion.

Related Work

Trust as a widely accepted fundamental component of human social relations has been studied in various scientific disciplines, such as psychology, sociology, organizational and economic sciences or IS research (Beatty et al. 2011). This variety has led to many different definitions influenced by the specific disciplinary views (McKnight et al. 2002; Wang and Emurian 2005). In a broad sense, trust is the confidence an individual has in his favorable expectations of what other individuals will do (often based on previous experiences) (Gefen 2000). The most prominent definition of trust (Rousseau et al. 1998) is proposed by Mayer et al. (1995) as the "*willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party.*" Most IS researchers follow this definition (Söllner et al. 2012b), although its roots are in the management discipline - more specifically, organizational trust with the focus on trust between people (Mayer et al. 1995).

Apart from this conceptual focus, trust helps to overcome perceptions of consumers related to uncertainty and risk. In turn, this encourages them to engage in trust-related behaviors, e.g., sharing personal information with a mobile application (McKnight et al. 2002). These perceptions are especially important when interacting with new IT artifacts. Hence, we focus on *initial trust beliefs* that are formed after the

first experience with IT artifacts. Initial trust refers to interactions among unfamiliar actors that are not based on any experience, firsthand knowledge, credible information about or effective bonds with each other (Bigley and Pearce 1998; McKnight et al. 1998). However, it should be noted that trust is not only about the initial interaction and may change over time while consistently using an IT artifact (Gefen et al. 2008).

The conceptualization of Mayer et al. (1995) focuses with its three trusting beliefs – ability, benevolence and integrity – on interpersonal trust. These trusting beliefs refer to the confident perception of a trustor that the trustee has attributes beneficial to the trustor (McKnight et al. 2002). This interpersonal point of view considers IT artifacts as an enabling ingredient between a trustor (e.g., a consumer) and the trustee (e.g., a online-vendor) (Gefen et al. 2003; McKnight and Chervany 2002; Pavlou 2003). Apart from this interpersonal view, *IT artifacts can take on a major role as an object of trust* (Vance et al. 2008). IT artifacts are often used, for example, as standalone tools for providing services such as shopping recommendations (Komiak and Benbasat 2006; Wang and Benbasat 2005), and therefore act as trustees.

Thus, we use the conceptualization of trust in *automated systems* (Muir 1987; Muir 1989) for information systems such as mobile applications. These IT artifacts exhibit some characteristics that require trust conceptualizations that account for an IT artifact as a trust object and, additionally, for technology-related trust antecedents. On the one hand, such applications are highly automated and therefore take the role as a trust object (Söllner et al. 2012b). They provide automatic recommendations, automatically collect personal data or change the preferences of a system by enabling the GPS sensor if a LBS are requested. On the other hand, mobile applications do not imitate human characteristics. The small screen size of mobile devices limits the depiction of human surrogate cues (for instance images or other multimedia elements that usually are available on full-size personal computers) (Vance et al. 2008). Thus, interpersonal-related trust attributes are missing, and users are forced to form trusting beliefs based on the perceived attributes of the IT artifact itself, usually consisting of technology-related attributes (Lippert 2001; McKnight 2005).

Three different *trust dimensions* are suggested as a taxonomy for structuring determinants that are the basis of trust: performance, process and purpose (Lee and Moray 1992; Lee and See 2004). The first trust dimension, performance, relies on the users' expectation of a consistent, stable and desirable performance of the IT artifact; more precisely, the capability to achieve the users' goals. The underlying qualities of an IT artifact are represented by the process dimension. These qualities control the behavior of the IT artifact, encompassing such things as data reduction methods or algorithms of the IT artifact. The second trust dimension, process information, describes how the IT artifact and its automation work. By developing a feeling for the process information behind the IT artifact itself, trust will increase. If this is not the case, because the IT artifact, for instance, provides unreliable process information, trust will decrease. The third trust dimension, purpose, deals with the underlying motives of the IT artifact, and thus reflects the intention of the publisher and/or provider of the IT artifact in creating this particular artifact. Hence, it describes why the IT artifact has been developed, and mirrors the perception of a positive orientation of the trustee (IT artifact) towards the trustor (IT user) (Lee and Moray 1992; Lee and See 2004).

Development of a Trust Model for Mobile Marketing Applications

Following the approach of trust in automated systems, we investigate trust for a mobile application based on the work of Lee and Moray (1992). As suggested, performance, process and purpose constitute the dimensions of trust. This taxonomy of trust dimensions reflects different characteristics of an IT artifact: the capabilities of an IT artifact (performance), its underlying qualities (process) and motives (purpose) (Lee and Moray 1992; Lee and See 2004). However, each dimension is, in turn, constituted by trust determinants (Lee and Moray 1992; Lee and See 2004). They are subsumed under the three trust dimensions and express the technology-related characteristics of the mobile application that are perceived by the user. Therefore, these trust determinants are also referred to as trust beliefs or trust antecedents.

The trust determinants collected by Lee and See (2004) form the basis for the trust model in a mobile marketing application. The authors completed a review to summarize trust determinants regarding automation, and arranged them according to the trust dimensions of Lee and Moray (1992). Apart from following these insights on trust in automation, we carried out a thorough literature review regarding trust determinants related to mobile applications for marketing purposes in order to identify additional

trust determinants that are especially important for mobile marketing applications. This was necessary because these loyalty marketing-driven IT artifacts exhibit characteristics that have not been considered systematically together in previous trust research.

In order to ensure that no part of the underlying trust dimensions was neglected, we examined various IT artifacts and their trust determinants to account for the typical functions of mobile marketing applications, including trust research within the areas of recommendation agents, mobile payment, LBS, mobile commerce and advertising applications, as well as online trust. The latter is taken into account because mobile technology can be considered a subset of online technology (Park and SuJin 2006), and it provides additional insights into the formation of trust. In the next step, we collected all trust determinants of these IT artifacts and arranged them under each trust dimension, still keeping the definitions of each trust dimension in mind. We summarized related trust determinants by one determinant. To make this process transparent, related trust determinants are reported in connection with their respective literature source. The results of this process are shown in Table 1.

Table 1. Trust Determinants

Trust Determinants	Related Trust Determinants
Reliability (Dahlberg et al. 2003; Lee and Turban 2001; Lippert 2001; McKnight et al. 2011; Siau and Shen 2003; Söllner et al. 2012b)	Perceived ubiquity (Zhou 2011); Transaction Errors (Dahlberg et al. 2003); Ubiquitous connectivity (Lee 2005)
Information Quality (Kahn et al. 2002; Kim et al. 2003; Kim et al. 2008; Siau and Shen 2003)	Error-freeness of information (Bart et al. 2005); Information accuracy (Söllner et al. 2012b); Timeliness (of information) (Moorman et al. 1993)
Functionality (Lankton and McKnight 2011; McKnight et al. 2011)	Responsibility (Söllner et al. 2012b)
Security (Belanger et al. 2002; Salisbury et al. 2001; Zhou 2011)	Authentication, Authorization, Confidentiality, Non-repudiation (Eze et al. 2008); Provision of security measures to protect collected personal information (Ahmed and Ho 2011); Security Controls (Cheung and Lee 2000; Siau and Shen 2003); Security Protection (Kim et al. 2003; Kim et al. 2008; Kim 2008)
Understandability (Madsen and Gregor 2000; Söllner et al. 2012b; Tan and Thoen 2000; Zuboff 1988)	Predictability (Beatty et al. 2011; Hancock et al. 2011; Jennings 1971; Lippert 2001; Söllner et al. 2012b); Transparency (Hancock et al. 2011)
Personalization (Komiak and Benbasat 2006)	Customization (Srinivasan et al. 2002)
User control (Ahmed and Ho 2011; Dholakia et al. 2001; Malhotra et al. 2004; Söllner et al. 2012a)	-
Privacy Control (Cheung and Lee 2000)	Authorized Data Usage (Söllner et al. 2012b); Privacy Concerns (Kim 2008)
Third-Party Recognition (Cheung and Lee 2000; Cheung and Lee 2006; Siau and Shen 2003)	Structural Assurances (Gefen et al. 2003); Third Party Privacy Seals (Xu et al. 2005)
Benevolence (Beatty et al. 2011; Siau and Shen 2003; Söllner et al. 2012b)	-

The performance dimension encompasses the trust determinants' reliability, information quality, functionality and security. While users increasingly rely on mobile applications (Kaasinen 2005), the *reliability* might be an important determinant of the performance trust dimension (Lee and Turban 2001). It refers to the belief that the application will *operate properly on a consistent basis* (McKnight et al. 2011). This is especially important for the early adoption of the application, since a disappointing performance due to reliability issues will affect the user's ability to employ the application, as well as achieving his goals (Siau and Shen 2003). The reliability is also connected with determinants such as the ubiquitous connectivity and connectedness (Lee 2005; Zhou 2011), encompassing the reliability of the device itself and that of the network (Dahlberg et al. 2003). If a mobile application and its included services are always unavailable, users may think the application does not have the ability to provide reliable service. Consequently, the application is considered to be untrustworthy.

A further hypothesis states that the *information quality* has a positive effect on the performance of the mobile application. The information quality refers to the *accuracy and completeness of the information* (Kim et al. 2003) displayed by the mobile application. The information quality affects the customers' perception regarding the application and its trustworthiness. In online environments, the information quality has proven to affect the user's trust positively, because high information quality emphasizes that an information provider is reliable and trustworthy (Kim et al. 2008). Related indicators to assess the information quality encompass determinants such as the timeliness of information and error-freeness or information accuracy (Bart et al. 2005; Kahn et al. 2002; Söllner et al. 2012b). For example, if a customer wants to know the way to a store nearby, a typical LBS provided by mobile marketing application is highly dependent on the information quality. Consequently, the quality of information is crucial to fulfill the goals of a user.

Another important factor which concerns the performance of an IT artifact is the *functionality* that refers to "*the degree to which an individual believes the technology will have the functions or features needed to accomplish one's task(s)"* (Lankton and McKnight 2011). Therefore, it is strongly linked to the systems performance and its capabilities. However, it forms the performance construct in connection with the individual features provided by an application. Possible functionalities necessary to fulfill the goals of a user include the identification at the Point-of-Sale (POS), the display of the bonus score or the mobile availability of coupons.

As mobile marketing applications deal with sensitive user and customer information, as well as new technologies such as Near Field Communication for identifying a customer at the checkout of a store, the security of a mobile application is crucial. Security as a determinant thus shows how secure a user feels while using an IT artifact, but it should be noted that this perception might be very different from the real security level, since it reflects only the user's perception (Yenisey et al. 2005). Based on this, the *security* refers to the extent to which one believes that an IT artifact is secure for transmitting sensitive information (Salisbury et al. 2001). Moreover, security has proven to be an important object to ensure users' trust in IT artifacts. Examples include mobile payment (Zhou 2011), m-commerce (Siau and Shen 2003) or online environments (Belanger et al. 2002; Kim et al. 2008; Koufaris and Hampton-Sosa 2004). Major assets endangered during usage of an application are the user's privacy represented by data stored on the mobile device (e.g., customer data, location profiles or address book contacts), the information transferred while using the application, and the operability of the device or the functionality itself (Madlmayr et al. 2008). In conclusion, we proposed five hypotheses with regards to the performance dimension:

Hypothesis H1: Performance will positively affect trust in the Mobile Application.
Hypotheses H1a: Reliability will positively affect the performance dimension of trust.
Hypothesis H1b: Information quality will positively affect the performance dimension of trust.
Hypothesis H1c: Functionality will positively affect the performance dimension of trust.
Hypothesis H1d: Security will positively affect the performance dimension of trust.

The process dimension consists of the trust determinants: understandability, personalization and user control. The first determinant, *understandability,* refers *to the perception of the understanding how an IT artifact works* (Söllner et al. 2012b) *by forming a mental model of the system and consequently predicting future system behavior* (Madsen and Gregor 2000). Hence, the understandability also correlates with the predictability of an IT artifact (Madsen and Gregor 2000). In general, the understanding of a technology encourages trust because it helps to evaluate the capabilities of an IT

artifact (Tan and Thoen 2000). In regards of a mobile application for marketing purposes, this determinant also refers to the collection of personal data while using it. If the application collects personal data without notifying the user, or does not allow the user to view collected data, it is obvious that such behavior of the application will not gain users' trust (Ahmed and Ho 2011; Liu et al. 2005).

Referring to the understanding of the future behavior of a system, a typical example of a mobile application is the GPS functionality. If a user wants to make use of a location-based service, an automated routine often enables GPS to locate the user. If this process is not predictable, for example, if GPS is enabled without any predictable routine or user input, users might evaluate this behavior to be suspicious and not trustworthy because they were not able to anticipate this routine in advance. Another typical example when considering mobile applications is the application permission. For instance, if someone downloads an application from Google PlayStore for an Android device, information is provided regarding which data the application is able to access. However, in reality, information is often missing; for whatever reason, the application requests certain permissions which negatively influence the understandability of an application, and, in turn, reduce trust.

The second determinant of the process dimension deals with the *personalization* capabilities of a mobile marketing application. This determinant corresponds to the extent to which *the application understands and represents the personal needs of the user* (Komiak and Benbasat 2006) and *the degree to which information is tailored to meet the needs of an individual user* (Dholakia et al. 2001). This determinant is especially important if the application provides any recommendations which are personalized for the user's needs. Mobile marketing applications often provide individual coupons or personalized suggestions for shops nearby based on the user's location. This personalization has proven to affect trust in a positive way by facilitating the perceived competence of the IT artifact and trustee (Komiak and Benbasat 2006).

Connected with the personalization of a mobile marketing application is the *user control* (the third determinant) over the IT artifact's processes. It refers to the extent to which an individual can choose the timing, content and sequence of a communication (Dholakia et al. 2001). The intention of this determinant is the possibility for users to be in control while using the application; for example, the control over the application's functionalities. These functionalities might include the collection of sensitive personal data and personalization level. The possibility to control such settings has proven to lower users' privacy concerns (Ahmed and Ho 2011; Liu et al. 2005; Malhotra et al. 2004) and support trust in an IT artifact (Söllner et al. 2012a). Users may want to configure privacy settings or the personalization level, for instance, based on previous experiences with the publisher and provider of the application (Ahmed and Ho 2011). Considering a mobile application, a user might have the opportunity to disable the LBS permanently, because he is afraid of location profiling, or the user is able to minimize the use of personal data by configuring the level of personalization. In summary, the process dimension is constituted by four hypotheses:

Hypothesis H2: Process will positively affect trust in the Mobile Application.
Hypotheses H2a: Understandability will positively affect the process dimension of trust.
Hypothesis H2b: Personalization will positively affect the process dimension of trust.
Hypothesis H2c: User control will positively affect the process dimension of trust.

The purpose dimension in this study constitutes three determinants: privacy control, third-party recognition and benevolence. The *privacy control* is the first trust determinant of the purpose dimension, corresponding to the *ability of the application provider to prevent unauthorized use or disclosure of personal information* (Cheung and Lee 2000). Connected with privacy control as a trust determinant is the authorized data usage, referring to the users' perception whether provided data are used as indicated or expected (Söllner et al. 2012b). Considering the smartphone application, this is especially important, as it allows the publisher of an application (and also the manufacturer) to collect sensitive and personal data. This makes users open to possible misuse (Söllner et al. 2012b). In regards of mobile applications, user profiles or credit card information is sensitive and vulnerable information. Although the collection of this data is usually only permitted by the terms of participation in the loyalty program and is additionally covered through the application permissions, reality shows that authorized use of data is sometimes not respected. For example, Apple's smartphone operation system iOS has logged location data, although all LBS were switched off. Doubtless, this behavior of an application could be perceived as misuse of trust.

Connected with the privacy control is *third-party recognition*, the second trust dimension referring to (privacy) seals of approval issued by third-parties such as the TRUSTe (Gefen et al. 2003; Xu et al. 2005). The foundation of this determinant is the thought that trust can be transferred from a trustworthy third-party to another actual trustee (Stewart 2003). The independent nature of the third-parties as a credible source helps users of the application to feel more secure (Koehn 2003; Siau and Shen 2003), as well as to form positive trust beliefs about the purpose of the application (Cheung and Lee 2006). Therefore, third-party recognition has proven to be a significant factor, influencing trust in a positive way, and, more importantly, reducing privacy risks (Cheung and Lee 2006; Rifon et al. 2005; Xu et al. 2005). In the case of mobile applications, third-party recognition is possible by providing information of third-parties in the application itself or at typical marketplaces for such applications.

Strongly related to the purpose of the application is the benevolence of the provider, the third trust dimenion which refers to the users' perception that the publisher and therefore the provider of the mobile marketing application will act according to the users' best interests (Beatty et al. 2011). In contrast to third-party recognition, benevolence covers information provided by the provider itself. For instance, a mobile marketing application could provide contact to developers (Gefen et al. 2003) if a user has any questions about the application's purpose. The provider benevolence also applies to the case of an application's permission. Often applications request permission that might ignore the users' interests and engage distrust; for instance, if a mobile marketing application requests the permission to read sensitive text messages. In sum, we proposed four hypotheses for the purpose dimension:

Hypothesis H3: Purpose will positively affect trust in the Mobile Application.
Hypotheses H3a: Privacy control will positively affect the purpose dimension of trust.
Hypothesis H3b: Third-party recognition will positively affect the purpose dimension of trust.
Hypothesis H3c: Benevolence will positively affect the purpose dimension of trust.

After taking the trust dimensions and their respective determinants into account, a major consequence of trust should be considered. The hypothesized relationship is related to the Theory of Reasoned Action (TRA) (Fishbein and Ajzen 1975). TRA was adapted to the trust context, for instance, by McKnight et al. (1998) in a simplified variant, who theorized that trusting beliefs lead to trusting intentions - the willingness to rely on the trustee. This process of trust formation has proven to positively affect an individual's intention to use an IT artifact (Shin 2010; Söllner et al. 2010; Wang and Benbasat 2005). Hence, there is strong evidence that people form trusting beliefs towards the actual IT artifact. These beliefs have strongly predicted the intention to use an IT artifact in previous studies (Vance et al. 2008), and thus it is hypothesized:

Hypothesis H4: Trust will positively affect the intention to use the mobile application.

A conclusive overlook of the trust model is depicted in Figure 1.

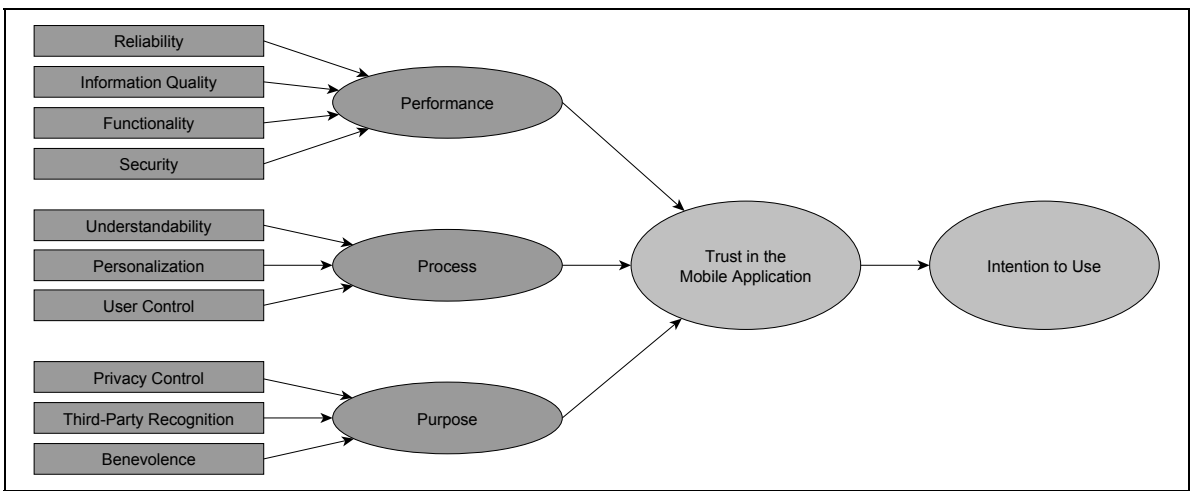

Figure 1. Results of the Trust Model for a Mobile Application

Research Method

To evaluate the impact of single determinants and dimensions, we used a free online experiment (Gefen 2002b) in which a mobile application was prototyped that simulates different functions based on a review of mobile marketing applications that are used for fostering customer loyalty. Screenshots are shown in Figure 2.

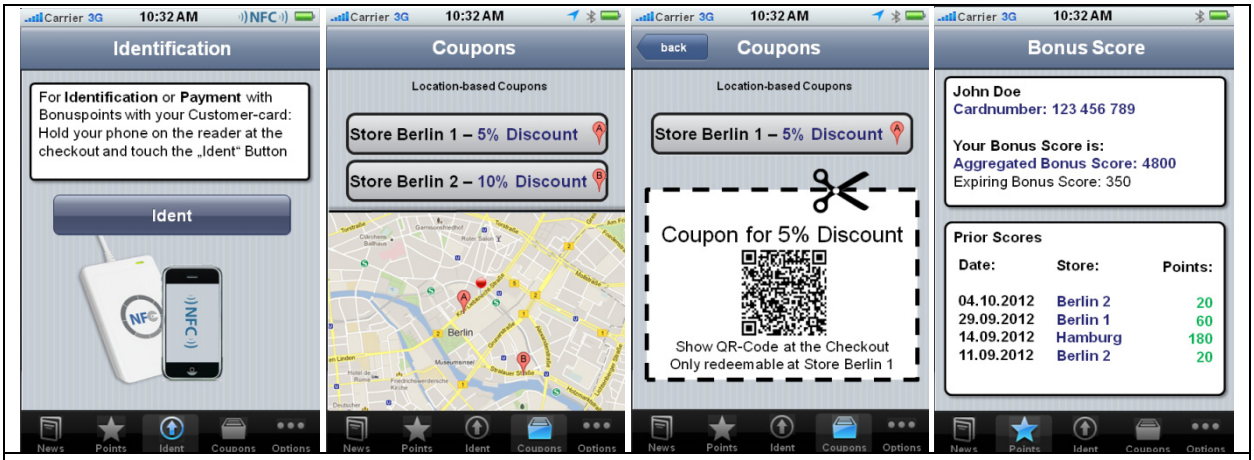

Figure 2. Screenshots of the Mobile Marketing Application Prototype

The provided functions included, amongst others, the possibility to view already collected bonus points in the loyalty program, the identification at a store checkout and the provision of location-based paperless coupons. Due to the fact that trust evolves out of interpretations of information, the web-based prototype mediates perceptions of its capabilities. Lee and See (2004) describe this process of trust formation as the dimension of abstraction that refers to information regarding the performance, process and purpose of the IT artifact. Building a new application, instead of using an already existing application, ensured that the application would be new for all participants, and should, therefore, be suitable for investigating initial trust in the application (Wang and Benbasat 2005). Additionally, using an application without a brand made it possible to control the effects of brand appeal on trust (Vance et al. 2008). The subjects were allowed to behave "naturally" with the prototype while they conducted three pre-assigned tasks.

In greater detail, the experiment proceeded as follows. A brief description of the idea of a mobile marketing application was given to subjects. To ensure that participants tested the application, three pre-assigned tasks were given and checked for correctness. In the first task, the participants were asked to check how many bonus points they had accumulated in the prototype. The second task counted for the location-based coupons. Participants were asked to redeem such a coupon in the prototype and then state in which city the location-based coupon was valid. In the last task, participants were asked to check all options the application offered and were asked to check which setting was enabled by default in the application. After finishing the three tasks, the participants were asked to complete the questionnaire requesting participants to assess the 44 items.

Instrument Development

We adopted all indicators of the *initial instrument* from the literature and adapted them to the context of mobile applications for marketing purposes. Table 2 shows the construct measures, their operationalization and literature sources of the indicators. We measured all latent variables with *reflective indicators* and checked the measurement instrument with regards to its suitability to measure the constructs in a reflective manner by either using properly specified reflective constructs listed by Petter et al. (Petter et al. 2007) or by checking the reflective constructs according to the guidelines of Jarvis et al. (Jarvis et al. 2003). To assess the indicators, we used a 7-point scale that ranged from 1 ("strongly disagree") on the left to 7 ("strongly agree") on the right, with 4 as a neutral point.

Table 2. Measurement of Constructs and Literature Sources					
Latent construct	Latent Construct Type	Sub-construct	Sub-Construct Type	Items	Literature Source
Performance	Formative	Reliability	Reflective	4	(McKnight et al. 2011)
		Information Quality	Reflective	4	(Kim et al. 2008)
		Functionality	Reflective	3	(McKnight et al. 2011)
		Security	Reflective	4	(Cheung and Lee 2000; Salisbury et al. 2001)
Process	Formative	Understandability	Reflective	4	(Madsen and Gregor 2000; Söllner et al. 2012b)
		Personalization	Reflective	4	(Komiak and Benbasat 2006; Srinivasan et al. 2002)
		User Control	Reflective	3	(Wu 2000)
Purpose	Formative	Privacy Control	Reflective	3	(Cheung and Lee 2000)
		Third-Party Recognition	Reflective	3	(Cheung and Lee 2000; Gefen et al. 2003)
		Benevolence	Reflective	4	(Bhattacherjee 2002; Gefen 2002b)
Trust in the Mobile Application	Reflective	None	None	3	(Cyr et al. 2009; Jarvenpaa et al. 1999; Komiak and Benbasat 2006)
Intention to Use	Reflective	None	None	5	(Prein 2011)

Data Collection and Modeling Methods

Participants for the free online experiment participated voluntarily and were recruited in several social media platforms in order to reach a diverse audience. In total, 116 participants completed the questionnaire after interacting with the prototype and solving the pre-assigned tasks. After consistency checks, 10 cases were discarded because participants always answered "strongly agree" or "strongly disagree" (6 cases), or because they exhibited more than 20 percent missing values (4 cases). A dataset with 106 cases remained. The sample consisted of 54 male and 52 female participants with an average age of 29.7 years. With respect to their educational background, 16.2 percent of the participants were in education and 69.5 percent had a university degree. Most of the participants had a smartphone device (88.7 percent) and 70.8 percent were members in a loyalty program.

In order to deal properly with missing values in the data set (5.7 percent assumed to be missing at random), we used *multiple imputation* (Rubin 1976). We replaced missing values with multiple (N > 1) plausible values to generate N completed data sets. The basis of the imputation process is the completed 106 datasets, which only contain cases with fewer than 20 percent missing values in order to ensure that the estimation of the missing values does not rely on a substantial degree of missing values (Prein 2011). Our tool of analysis for the imputation was SPSS 20.We thus generated 20 imputed data sets and consolidated them (Rubin 1987) before further analyzing them. We used the fully conditional specification (FCS) algorithm for the imputation of the missing data (van Buuren 2007), and the predictive mean matching approach was used as a model for the variables (Little 1988; Rubin 1986). The latter approach has proven to be suitable for estimating missing values in data sets with 5 percent missing values (Landermann et al. 1997).

To evaluate the proposed structural equation model in this study, we used the variance-based *partial least squares* (PLS) approach (Chin 1998; Wold 1982). We chose this approach because it is more suitable to identifying key driver constructs than are covariance-based approaches (Hair et al. 2011). Further, the sample size (n=106) is sufficient for PLS because the minimum number of cases requires 10 times the largest number of structural paths impacting a construct (performance: 4), resulting in a minimum number of 40 cases (Chin 1998). As our model consists of hierarchical latent variables, i.e., the trust dimensions, a type II second-order factor model was applied (Jarvis et al. 2003; Ringle et al. 2012). Since the trust dimensions are somehow exogenous constructs, and no other latent constructs (except for the trust determinants) act like predecessors, we followed the suggestions of Ringle et al. (2012) and Becker et al. (2012) to use the repeated indicator approach (Mode A for repeated indicators), instead of the two-step approach (Wetzels et al. 2009; Wold 1982). In order to obtain unbiased results, we made the number of indicators for every first-order construct equal (Chin 1997; Ringle et al. 2012). We used SmartPLS 2.0 M3 (Ringle et al. 2005) as analysis tool.

Common Method Variances

Common method variances that are caused by the measurement method rather than the construct measures were also taken into account (Podsakoff et al. 2003). To control these biases, we made several procedural remedies. In order to ensure a psychological separation of measurement, we did not reveal the purpose of the experiment and provided a cover story (Podsakoff et al. 2003). Additionally, we assured the anonymity of the participants. In order to control for effects such as socially desirable responses (Paulhus 2002), we assured that there were no wrong answers and that the respondents answered questions as honestly as possible (Podsakoff et al. 2003). Afterwards, we conducted the Harmann's Single Factor Test (Podsakoff et al. 2003). We performed an exploratory factor analysis with all of the model indicators and examined the unrotated factor solution. Because more than one factor emerged and the first factor does not account for the majority of covariance among the measures, common method variances should not be a major problem within this study (Podsakoff et al. 2003).

Results

The *evaluation* of the proposed model followed a two-step process, encompassing the evaluation of the outer model in a first step, followed by the evaluation of the inner model in a second step (Hair et al. 2011; Hair et al. 2012; Henseler et al. 2009). In the first step, the evaluation focused on the different measurement models to reveal the reliability and validity to certain criteria that are associated with latent variables. The evaluation of the inner model and the structural relationships followed in a second step, because the evaluation only makes sense if the outer model evaluation shows evidence of sufficient reliability and validity (Henseler et al. 2009). In accordance with recent research regarding hierarchical latent variable models with repeated indicators, the outer model evaluation included only the first order constructs (Becker et al. 2012). The quality criteria of the outer model are reported in Table 3.

Some indicators of the initial indicator set had to be dropped to avoid biased results of the hierarchical latent variables. It was necessary to drop indicators if the number of indicators among the first-order constructs of a second-order construct was unequal (Ringle et al. 2012). We assessed the indicator reliability with the standardized indicator loadings. All the remaining indicators loaded above the threshold of ≥ 0.70 (Hulland 1999). We assessed the internal consistency reliability by checking the composite reliability, because it is more suitable for PLS structural equation models than is Cronbach's alpha (Hair et al. 2011; Hair et al. 2012). Values above 0.70 indicated that the composite reliability values for the latent constructs were acceptable (Bagozzi and Yi 1988). We assessed the convergent validity with the average variance extracted (AVE). Values of AVE are all above 0.50 and therefore acceptable (Bagozzi and Yi 1988).

Table 3. Quality Criteria of the Constructs and Literature Sources				
Construct	Indicators	Loadings	AVE	Composite Reliability
Reliability	REL1	.907	.827	.935
	REL2	.891		
	REL4	.929		
Information Quality	IQ1	.860	.754	.902
	IQ2	.882		
	IQ4	.863		
Functionality	FUNC1	.883	.712	.881
	FUNC2	.756		
	FUNC3	.885		
Security	Sec1	.810	.810	.927
	Sec2	.860		
	Sec4	.938		
Understandability	Und1	.854	.677	.862
	Und3	.877		
	Und4	.730		
Personalization	Pers1	.875	.696	.873
	Pers2	.876		
	Pers3	.746		
User Control	Cont1	.895	.712	.881
	Cont2	.855		
	Cont3	.776		
Privacy Control	PPC1	.861	.758	.904
	PPC2	.843		
	PPC3	.907		
Third-Party Recognition	3rdP1	.893	.766	.908
	3rdP2	.880		
	3rdP3	.852		
Benevolence	Ben3	.928	.869	.952
	Ben4	.904		
	Ben4	.964		
Trust	Tru1	.946	.857	.948
	Tru2	.923		
	Tru3	.908		
Intention to Use	Int2	.921	.862	.950
	Int4	.916		
	Int5	.948		

Afterwards, we first assessed the discriminant validity with the Fornell-Larcker criterion (Fornell and Larcker 1981). As Table 4 shows, this criterion is fulfilled by the data, because the square root value of each latent variable's AVE was higher than the latent variable's correlation with any other latent variable. Second, results of the cross-loadings showed that all indicators loaded highest on their intended constructs (Chin 1998) Because the outer model evaluation showed sufficient reliability and validity, we can now proceed to evaluate the results of the inner model.

Table 4. Assessment of Discriminant Validity*

Construct	1	2	3	4	5	6	7	8	9	10	11	12
1. Reliability	**.91**											
2. Information Quality	.70	**.87**										
3. Functionality	.68	.82	**.84**									
4. Security	.68	.46	.52	**.90**								
5. Understandability	.53	.65	.60	.34	**.82**							
6. Personalization	.63	.68	.68	.42	.69	**.83**						
7. User Control	.52	.55	.49	.21	.74	.63	**.84**					
8. Privacy Control	.54	.54	.61	.76	.39	.49	.28	**.87**				
9. Third-Party Recognition	.44	.44	.48	.63	.34	.28	.27	.65	**.88**			
10. Benevolence	.47	.55	.53	.47	.42	.48	.26	.64	.44	**.93**		
11. Trust	.74	.66	.65	.68	.49	.57	.34	.77	.55	.61	**.93**	
12. Intention to Use	.57	.60	.59	.41	.49	.52	.34	.38	.31	.41	.58	**.93**

* Diagonal elements are square roots of the AVE and all off-diagonal elements are correlations of the latent variables.

Results of the inner model included the path coefficients, explained variances and significance levels. The evaluation also encompassed an assessment of the effect sizes and predictive relevance (Ringle et al. 2012). The path weighting scheme was used as a PLS algorithm with 300 iterations (Henseler 2010). The bootstrapping procedure was used to assess the significance of the path coefficient estimates. The number of bootstrap samples was 5,000 (Henseler et al. 2009). Individual sign changes were used as sign change option (Hair et al. 2011). The results of the inner model are depicted in Figure 3.

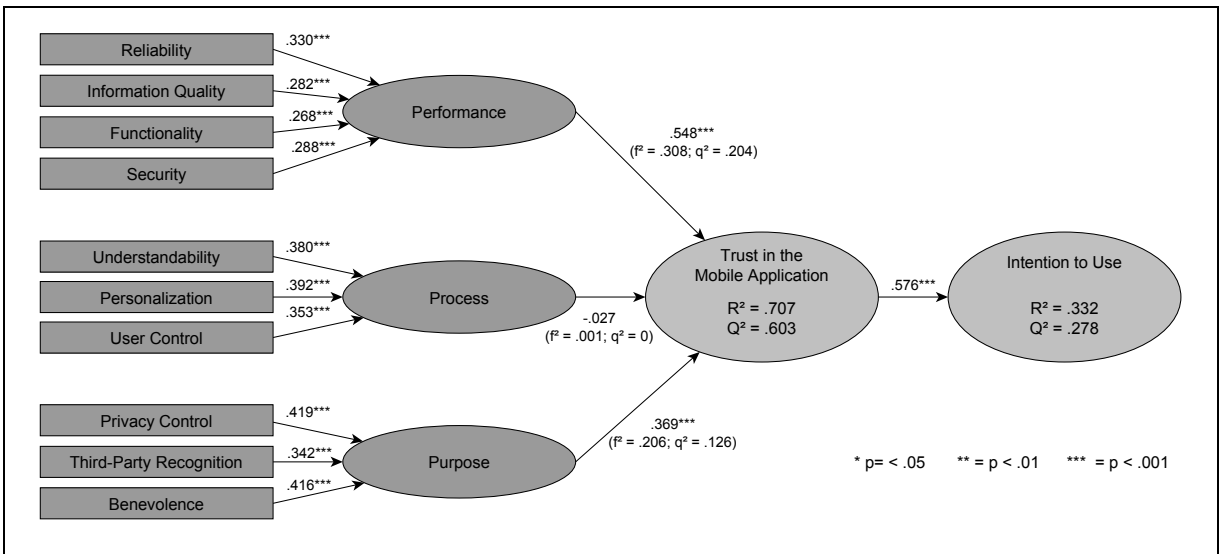

Figure 3. Results of the Trust Model for a Mobile Marketing Application

The results of the structural model indicated that all relationships, except for the process dimension on trust, are supported and significant at a level of .001 percent. All trust determinants had a significant impact on their respective trust dimensions. According to the value of the path coefficients, reliability had the highest influence on the performance dimension. Considering process, personalization had the highest influence, closely followed by understandability. Privacy control and benevolence had nearly the same impact on the purpose and were more important than those of the third-party recognition. On a superior level, the trust dimension performance and purpose had a significant impact on trust. The path coefficients of the two dimensions provided evidence that the performance dimension had the highest impact on trust, followed by the purpose dimension. However, in our study the process dimension had no significant influence on trust. Finally, trust had a significant impact on intention to use the mobile application. The results of the hypothesis tests are summarized in Table 5.

Table 5. Summary of Hypotheses

Hypotheses and Corresponding Paths		Support?
H1	Performance → (+) Trust	Yes
H1a	Reliability → (+) Performance	Yes
H1b	Information quality→ (+) Performance	Yes
H1c	Functionality → (+) Performance	Yes
H1d	Security → (+) Performance	Yes
H2	Process → (+) Trust	No
H2a	Understandability → (+) Process	Yes
H2b	Personalization → (+) Process	Yes
H2c	User control → (+) Process	Yes
H3	Purpose → (+) Trust	Yes
H3a	Privacy control → (+) Purpose	Yes
H3b	Third-party recognition → (+) Process	Yes
H3c	Benevolence → (+) Process	Yes
H4	Trust → (+) Intention to use	Yes

A redundancy analysis was conducted by measuring trust with three reflective indicators (Cenfetelli and Bassellier 2009; Chin 1998) to assess the explained variance in trust by the three formative trust dimensions. The result of $R^2 = .707$ showed that a substantial amount of variance was explained by the three trust dimensions (Chin 1998). Since the three trust dimensions were modeled through the repeated indicator approach, all of their variance was explained through the indicators (Ringle et al. 2012). Finally, Intention to Use showed with $R^2 = .332$, a moderate level of explained variance (Chin 1998). Furthermore, the effect size f^2 of the three trust dimensions on trust was considered in the evaluation of the structural model, which represents the relative impact of a single exogenous construct on a endogenous construct by means of changes in the R^2 values (Cohen 1988). Values above 0.02, 0.15 and 0.35, respectively, indicate a small, medium or large impact, that is, whether a preceding construct has a weak, medium or large effect on a structural level (Henseler et al. 2009). The results showed that performance has a medium effect ($f^2 = .308$), process had no effect ($f^2 = .001$) and purpose also had a medium effect ($f^2 = 0.206$) on trust.

In a last step, we evaluated the predictive relevance as a conclusive assessment of the structural model (Chin 1998). We assessed the predictive relevance with a sample re-use technique proposed by Stone (Stone 1974) and Geisser (Geisser 1975) in order to measure Q^2 with the blindfolding procedure. This procedure omits in a systematic way one part of the data and uses the resulting estimates to predict the omitted part (Hair et al. 2011). The omission distance *d* refers to the distance between the omission of two consecutively omitted, and predicted, data points. As recommended in the literature, we chose the value of the omission distance *d* between 5 and 10 ($d = 7$), and *d* was not a multiple integer of the analyzed cases

(n=106) (Hair et al. 2012). We further assessed Q^2 as the cross-validated redundancy measure, which, in contrast to the cross-validated communality, estimates the structural model and measurement models for the data prediction (Hair et al. 2011). The blindfolding procedure is applied to endogenous, reflective constructs and if the value of Q^2 is larger than zero for a particular construct, its explanatory variables have a predictive relevance (Henseler et al. 2009). Trust in the mobile marketing application (Q^2 = .603) and Intention to Use (Q^2 = .278) had both values above the threshold value of zero and therefore indicated the predictive relevance of the structural model. Similar to the effect size f^2, the relative impact of the predictive relevance can be evaluated by the measure q^2: values above 0.02, 0.15 and 0.35 indicate a small, medium or large predictive relevance of certain constructs, explaining the endogenous construct that is evaluated (Henseler et al. 2009). Our results show that performance (q^2 = .204) had a medium relative predictive relevance, process (q^2 = 0) had no relative predictive relevance for trust and, finally, purpose (q^2 = .126) had a small relative predictive relevance on trust.

Discussion and Implications

Our study investigates the formation of trust in a mobile marketing application in order to overcome adoption barriers, for which reason we have developed a trust model based on the theoretical background of trust in automation. This model accounts for the nature of such applications, since they act as trust objects and only provide technology-related trust attributes. Hence, our trust model consisted of the three trust dimensions, performance, process and purpose, which are all constituted by their respective trust determinants. The latter were identified by carrying out a thorough literature review. To investigate the formation of trust in such an application, an empirical study was conducted. The discussion of the empirical results addresses the trust model applied in this study and the results regarding the single trust dimensions and underlying determinants. The trust model explains a substantial amount of variance in trust in the mobile marketing application. The trust model based on the trust dimensions of Lee and Moray (1992) with its confirmed predictive relevance is suitable for investigating trust in an IT artifact (Söllner et al. 2012b).

The study reveals that performance is the most important factor of trust in a mobile marketing application. The performance describes the capability of the application to achieve users' goals, and is especially important in shopping situations. For instance, identifying a customer at the checkout in a store can be very irritating if the application does not work properly. Hence, it is not surprising that this dimension is a significant driver of trust. The findings of the performance dimension indicate that reliability has the most influence on its dimension and is a strong sign of trustworthiness for the user. Therefore, it is crucial to influence the user perception by providing information cues that the IT artifact is working reliable, for example, by indicating the connection status in the application. Security with its high influence is also an important construct and should be addressed by indicating, for instance, a secure connection to the user. Information quality has an almost similar influence, closely followed by functionality. These results show that users do not want to be disappointed by the application, e.g., experiencing unreliable shopping behavior at the checkout counter or finding wrong information when searching for a store nearby or missing functionalities.

Furthermore, the results show that the process dimension has no significant impact on trust. An explanation for this result is the fact that the underlying mechanisms are not that important for this particular type of application. Indeed, these applications depend on their underlying mechanisms, e.g., changing system preferences if the user requests a certain function such as the store search. Nevertheless, these mechanisms are not that extensive in comparison to IT artifacts such as recommendation agents that clearly depend on the results of recommendations determined by underlying mechanisms (Söllner et al. 2012b).

However, there are also surprising results. Since the focus of this study is initial trust, the study focuses on the early stage of a trust relationship. At this stage, only a short history of the IT artifact's performance is available, but there is a clear statement of the IT artifact's purpose (Lee and See 2004). Therefore, initial trust should depend more on the purpose of an IT artifact than on performance (Lee and See 2004). In our study, although, the influence of the purpose is lower than that of performance, it is still highly significant. Indeed, considering the purpose of mobile applications for marketing purposes as customer data generating IT artifacts, it is no surprise that the purpose of the application plays a significant role.

Smartphones as personal companions provide considerable sensitive information that can be disclosed through the use. An application that discloses a customer's complete information to the publisher of the application, although such disclosure of personal data is unnecessary for the use of the IT artifact, might not gain trust and could offend the code of fair play between a customer and a company. Therefore, it is obvious that trust in such an application is also strongly dependent on its purpose.

The results of the purpose dimension show the high influence of the associated trust determinants: privacy control and benevolence. Privacy control has a slightly higher impact, which highlights the importance of preventing unauthorized use and/or disclosure of personal information for the user of an application and also its effects on trust (Cheung and Lee 2000). Yet, benevolence has a nearly similar impact on the purpose dimension. Hence, providers of mobile applications for marketing purposes should focus on the use and disclosure of personal data. It should be clear how data and also application permissions are used, for example, by providing privacy statements. However, we do not argue that marketers should not collect any data of their customers. Of course we acknowledge the purpose of such an IT artifact, one that is built to gather customer data and gain deep insights into customer behavior. This might also be clear to the majority of customers, since they are rewarded for specific customer behavior. The third determinant Third-party Recognition has a slightly lower impact, but is still significant. This coincides with other empirical results (Cheung and Lee 2006; Xu et al. 2005), which have proven the positive influence of third-party recognition. However, taking the results of Kim and Kim (2011) into account, it is also important to display the logo of the third party prominently so that it is easily visible for the user. Otherwise, the logo remains unnoticed and does not earn trust.

Limitations and Future Research

We acknowledge several limitations to this study that then underline a demand for future research. The study is limited to the investigation of trust in an IT artifact for mobile marketing measures. In contrast, prior studies studied these measures in general, without investigating the IT artifact systematically (Mann and Prein 2010; Prein 2011). Therefore a limitation of the study is that interactions with non-IT constructs have been neglected. For this reason, future research should take possible interaction dependencies into account. One example might be the effects of a company's reputation on trust in the IT artifact and the marketing measure in general. An important consideration would be the impact of trust on the actual loyalty of a customer, which is the main goal of the researched IT artifact (Gefen 2002a). Also, moderating effects should be taken into account, for example, cultural effects. In addition, although taking into consideration the large number of reviewed research contributions, other trust determinants may influence trust. These determinants should be of interest in future research, for instance the perceived ease of use. It might also be of interest to explore how a trust-enhanced mobile marketing application influences the actual trusting beliefs towards the IT artifact.

Further, we argue in this paper that, for example, the use and disclosure of personal data should be clearly explained to the customer in order to increase trust. This hypothesis is clearly confirmed through the data analysis. However, since mobile marketing applications use an enormous amount of data, it still has to be verified whether a transparent information policy with regards to the use and disclosure of personal data is constructive. It would be conceivable that such a transparent approach could cause an opposite effect, because customers might be afraid and do not use the IT artifact at all. Hence, future research should evaluate whether trust supporting components for mobile marketing IT artifacts really engage trust (Leimeister et al. 2005), following, for example, the methodology of Söllner et al. (2012a).

There are some threats to the internal and external validity of the empirical study, concerning the unambiguousness and generalizability of the results (Bordens and Abbott 2011; Christensen et al. 2010). Characteristics of the convenience sample could threaten the internal validity (Bordens and Abbott 2011). As it is a non-probability sampling, its internal validity is threatened by its inhomogeneity (Bordens and Abbott 2011). Moreover, there might be self-selection effects of the sample, because the participation was on a voluntary basis (Bordens and Abbott 2011). Additionally, participants were recruited from social media platforms, consequently biasing the results, as these participants might have had different perceptions regarding such an "innovative" application. Accordingly, future research might evaluate the model with more homogenous samples to avoid such effects.

The external validity of our measurement instrument could be endangered. Although it is common practice in research to drop indicators of an initial indicator set (Bhattacherjee 2002; Gefen et al. 2003; McKnight et al. 2011), the procedure to drop items because of the repeated indicator approach (to ensure unbiased results) or low indicator loadings could threaten the external validity of the measurement instrument and results. Further, the adoption of the measurement instrument from various sources and the translation to the German language is a threat to its validity. Additional threats to the external validity could occur from the use of a web-based prototype of the application. Although it was ensured that the prototype reflects the typical functions of such an application and that the setting as a free experiment ensured that participants can behave naturally while interacting with the prototype, it might be not an adequate substitute for a mobile device within a real life setting. Therefore, future research should assess the model within field experiments.

The same measurement instrument was used among all participants of the study to assess the dependent and independent latent variables, meaning common method variances could be a problem of this study. Nevertheless, procedural remedies were taken to avoid biases ex-ante. Moreover, Harmann's Single Factor test was conducted ex-post, and provided evidence that common method variances should not be a major problem in this study. However, this test also has its limitations (Podsakoff et al. 2003), and thus biases cannot be absolutely excluded.

The study examined initial trust and did not account for the development of trusting beliefs over time (Gefen et al. 2008). Hence, the necessity to conduct longitudinal studies, regarding how trust in such an application evolves over time, arises. Therefore, it is reasonable to check which effects trust has on the trust-related behavior and to assess the actual use of the mobile marketing application in future studies.

Conclusion

Trust is a crucial construct considering the adoption of mobile marketing applications. To evaluate how trust can be stimulated for such applications, we conducted a literature review based on the trust dimensions: performance, process and purpose and identified important trust determinants in trust theory to answer our first research question (regarding the antecedents that determine customers' trust in a mobile application for marketing purposes). To answer our second research question (regarding the impact of these specific trust antecedents), we evaluated the trust dimensions' particular relationships and impact on trust. We gathered our data in a free online experiment and analyzed the data and our proposed model in a PLS structural equation model. By means of a formative modeling of the trust dimensions and their respective determinants in a third-order trust model, it was possible to evaluate their single impact trust antecedents. The results in our study showed that performance and purpose with their corresponding determinants have a significant impact on trust. Surprisingly, the process dimension showed to be without a significant impact on trust.

Indeed, the discussion about models for the formation of trust is ongoing. Nevertheless, in this study we offer as contributions a few starting points for how trust and intention to use can already be enhanced during the design process by providing technology-related trust determinants. By focusing on technology-related trust determinants instead of human attributes, it is easier to derive design implications for a trustworthy IT artifact. For instance, the systematical consideration of trust-based requirements offers a starting point for how trust can be enhanced in an early stage of a development project (Hoffmann et al. 2013). In this study concerned with trust in a mobile marketing application, performance and privacy-related trust determinants are vitally important because of their high impact on trust. Consequently, they should be addressed in the design of applications.

References

Ahmed, R., and Ho, S.Y. 2011. "Privacy Concerns of Users for Location-Based Mobile Personalization," CONF-IRM 2011 Proceedings. Paper 10.

Bagozzi, R.P., and Yi, Y. 1988. "On the Evaluation of Structural Equation Models," Journal of the Academy of Marketing Science (16:1), pp. 74–94.

Bart, Y., Shankar, V., Sultan, F., and Urban, G.L. 2005. "Are the Drivers and Role of Online Trust the Same for All Web Sites and Consumers? A Large-Scale Exploratory Empirical Study," Journal of Marketing (69:4), pp. 133–152.

Bauer, H.H., Barnes, S.J., Reichardt, T., and Neumann, M.M. 2005. "Driving Consumer Acceptance of Mobile Marketing: A Theoretical Framework and Empirical Study," Journal of Electronic Commerce Research (6:3), pp. 181–192.

Beatty, P., Reay, I., Dick, S., and Miller, J. 2011. "Consumer Trust in E-Commerce Web Sites: A Meta-Study," ACM Computing Surveys (43:3), pp. 1–46.

Becker, J.-M., Klein, K., and Wetzels, M. 2012. "Hierarchical Latent Variable Models in Pls-Sem: Guidelines for Using Reflective-Formative Type Models," Long Range Planning (45:5-6), pp. 359–394.

Belanger, F., Hiller, J.S., and Smith, W.J. 2002. "Trustworthiness in Electronic Commerce: The Role of Privacy, Security, and Site Attributes," The Journal of Strategic Information Systems (11:3), pp. 245–270.

Bhattacherjee, A. 2002. "Individual Trust in Online Firms: Scale Development and Initial Test," Journal of Management Information Systems (19:1), pp. 211–241.

Bigley, G.A., and Pearce, J.L. 1998. "Straining for Shared Meaning in Organization Science: Problems of Trust and Distrust," Academy of Management Review (23:3), pp. 405–421.

Bordens, K.S., and Abbott, B.B. 2011. Research Design and Methods: A Process Approach, (8 ed.). New York: McGraw-Hill.

Cenfetelli, R.T., and Bassellier, G. 2009. "Interpretation of Formative Measurement in Information Systems Research," MIS Quarterly (33:4), pp. 689-707.

Cheung, C., and Lee, M.K.O. 2000. "Trust in Internet Shopping: A Proposed Model and Measurement Instrument," AMCIS 2000 Proceedings. Paper 406.

Cheung, C.M.K., and Lee, M.K.O. 2006. "Understanding Consumer Trust in Internet Shopping: A Multidisciplinary Approach," Journal of the American Society for Information Science and Technology (57:4), pp. 479–492.

Chin, W.W. 1997. "Overview of the Pls-Method." Retrieved 05.09.2012, from http://disc-nt.cba.uh.edu/chin/PLSINTRO.HTM

Chin, W.W. 1998. "The Partial Least Squares Approach for Structural Equation Modeling," in Modern Methods for Business Research, G.A. Marcoulides (ed.). Mahwah, N.J.: Lawrence Erlbaum, pp. 295–336.

Christensen, L.B., Johnson, B., and Turner, L. 2010. Research Methods, and Design, and Analysis, (11 ed.). Harlow: Pearson Education.

Clark, S. 2012. "Gartner Places Nfc in 'Trough of Disillusionment'." Retrieved 21.08.2012, from http://www.nfcworld.com/2012/08/16/317281/gartner-places-nfc-in-trough-of-disillusionment/

Cohen, J. 1988. Statistical Power Analysis for the Behavioral Sciences, (2 ed.). Hillsdale, NJ.: Lawrence Erlbaum.

Cyr, D., Head, M., Larios, H., and Pan, B. 2009. "Exploring Human Images in Website Design: A Multi-Method Approach," MIS Quarterly (33:3), pp. 539-566.

Dahlberg, T., Mallat, N., and Öörni, A. 2003. "Trust Enhanced Technology Acceptance Model–Consumer Acceptance of Mobile Payment Solutions," Stockholm Mobility Roundtable, Stockholm, Sweden.

Dholakia, R.R., Zhao, M., Dholakia, N., and Fortin, D.R. 2001. "Interactivity and Revisits to Websites: A Theoretical Framework," Proceedings of the 2001 AMA Winter Educators' Conference, pp. 108-115.

Eze, U.C., Gan, G.G.G., Ademu, J., and Tella, S.A. 2008. "Modelling User Trust and Mobile Payment Adoption: A Conceptual Framework," Communications of the IBIMA (3:29), pp. 224–231.

Fishbein, M., and Ajzen, I. 1975. Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Reading, Mass: Addison-Wesley Pub. Co.

Fornell, C., and Larcker, D.F. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," Journal of Marketing Research (18:1), pp. 39–50.

Gefen, D. 2000. "E-Commerce: The Role of Familiarity and Trust," Omega (28:6), pp. 725–737.

Gefen, D. 2002a. "Customer Loyalty in E-Commerce," Journal of the Association for Information Systems (3:1), pp. 27–51.

Gefen, D. 2002b. "Reflections on the Dimensions of Trust and Trustworthiness among Online Consumers," SIGMIS Database (33:3), pp. 38–53.

Gefen, D., Benbasat, I., and Pavlou, P.A. 2008. "A Research Agenda for Trust in Online Environments," Journal of Management Information Systems (24:4), pp. 275–286.

Gefen, D., Karahanna, E., and Straub, D.W. 2003. "Trust and Tam in Online Shopping: An Integrated Model," MIS Quarterly (27:1), pp. 51–90.
Geisser, S. 1975. "The Predictive Sample Reuse Method with Applications," Journal of the American Statistical Association (70:350), pp. 320–328.
Goldman, S.M. 2010. "Transformers," Journal of Consumer Marketing (27:5), pp. 469–473.
Hair, J.F., Ringle, C.M., and Sarstedt, M. 2011. "Pls-Sem: Indeed a Silver Bullet," Journal of Marketing Theory and Practice (18:2), pp. 139–152.
Hair, J.F., Sarstedt, M., Ringle, C.M., and Mena, J.A. 2012. "An Assessment of the Use of Partial Least Squares Structural Equation Modeling in Marketing Research," Journal of the Academy of Marketing Science (40:3), pp. 414–433.
Hancock, P.A., Billings, D.R., Schaefer, K.E., Chen, J.Y.C., Visser, E.J., and Parasuraman, R. 2011. "A Meta-Analysis of Factors Affecting Trust in Human-Robot Interaction," Human Factors: The Journal of the Human Factors and Ergonomics Society (53:5), pp. 517–527.
Henseler, J. 2010. "On the Convergence of the Partial Least Squares Path Modeling Algorithm," Computational Statistics (25:1), pp. 107–120.
Henseler, J., Ringle, C.M., and Sinkovics, R.R. 2009. "The Use of Partial Least Squares Path Modeling in International Marketing," in Advances in International Marketing, R.R. Sinkovics and P.N. Ghauri (eds.). Bingley: Emerald, pp. 277–320.
Hoffmann, A., Hoffmann, H., and Söllner, M. 2013. "Fostering Initial Trust in Applications – Developing and Evaluating Requirement Patterns for Application Websites," in: 21st European Conference on Information Systems ECIS. Utrecht, The Netherlands.
Hulland, J. 1999. "Use of Partial Least Squares (Pls) in Strategic Management Research: A Review of Four Recent Studies," Strategic Management Journal (20:2), pp. 195–204.
Jarvenpaa, S.L., Tractinsky, N., and Saarinen, L. 1999. "Consumer Trust in an Internet Store: A Cross-Cultural Validation," Journal of Computer-Mediated Communication (5:2), pp. 1-35.
Jarvis, C.B., MacKenzie, S.B., and Podsakoff, P.M. 2003. "A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research," Journal of Consumer Research (30:2), pp. 199–218.
Jennings, E.E. 1971. The Mobile Manager: A Study of the New Generation of Top Executives, (1 ed.). New York: McGraw-Hill.
Kaasinen, E. 2005. User Acceptance of Mobile Services: Value, Ease of Use, Trust and Ease of Adoption. Espoo, Finland: VTT Technical Research Centre of Finland.
Kahn, B.K., Strong, D.M., and Wang, R.Y. 2002. "Information Quality Benchmarks: Product and Service Performance," Communications of the ACM (45:4), pp. 184–192.
Kim, D., Ferrin, D., and Rao, R. 2003. "Antecedents of Consumer Trust in B-to-C Electronic Commerce," AMCIS 2003 Proceedings. Paper 21.
Kim, D.J., Ferrin, D.L., and Rao, H.R. 2008. "A Trust-Based Consumer Decision-Making Model in Electronic Commerce: The Role of Trust, Perceived Risk, and Their Antecedents," Decision Support Systems (44:2), pp. 544–564.
Kim, D.J.N. 2008. "Self-Perception-Based Versus Transference-Based Trust Determinants in Computer-Mediated Transactions: A Cross-Cultural Comparison Study," Journal of Management Information Systems (24:4), pp. 13–45.
Kim, K., and Kim, J. 2011. "Third-Party Privacy Certification as an Online Advertising Strategy: An Investigation of the Factors Affecting the Relationship between Third-Party Certification and Initial Trust," Journal of Interactive Marketing (25:3), pp. 145–158.
Koehn, D. 2003. "The Nature of and Conditions for Online Trust," Journal of Business Ethics (43:1/2), pp. 3–19.
Komiak, S.Y.X., and Benbasat, I. 2006. "The Effects of Personalization and Familiarity on Trust and Adoption of Recommendation Agents," MIS Quarterly (30:4), pp. 941–960.
Koufaris, M., and Hampton-Sosa, W. 2004. "The Development of Initial Trust in an Online Company by New Customers," Information & Management (41:3), pp. 377–397.
Lamarre, A., Galarneau, S., and Boeck, H. 2012. "Mobile Marketing and Consumer Behavior Current Research Trends," International Journal of Latest Trends in Computing (3:1), pp. 1–9.
Landermann, L.R., Land, K.C., and Pieper, C.F. 1997. "An Empirical Evaluation of the Predictive Mean Matching Method for Imputing Missing Values," Sociological Methods & Research (26:1), pp. 3–33.
Lankton, N.K., and McKnight, H.D. 2011. "What Does It Mean to Trust Facebook?: Examining Technology and Interpersonal Trust Beliefs," SIGMIS Database (42:2), pp. 32–54.

Lee, J., and Moray, N. 1992. "Trust, Control Strategies and Allocation of Function in Human-Machine Systems," Ergonomics (35:10), pp. 1243–1270.
Lee, J.D., and See, K.A. 2004. "Trust in Automation: Designing for Appropriate Reliance," Human Factors: The Journal of the Human Factors and Ergonomics Society (46:1), pp. 50–80.
Lee, M.K.O., and Turban, E. 2001. "A Trust Model for Consumer Internet Shopping," International Journal of Electronic Commerce (6:1), pp. 75–91.
Lee, T. 2005. "The Impact of Perceptions of Interactivity on Customer Trust and Transaction Intentions in Mobile Commerce," Journal of Electronic Commerce Research (6:3), pp. 165–180.
Leimeister, J.M., Ebner, W., and Krcmar, H. 2005. "Design, Implementation, and Evaluation of Trust-Supporting Components in Virtual Communities for Patients," J. Manage. Inf. Syst. (21:4), pp. 101-131.
Lippert, S.K. 2001. An Exploratory Study into the Relevance of Trust in the Context of Information Systems Technology. Washington, D.C.: Ph.D. Dissertation, Department of Management Science, George Washington University.
Little, R.J.A. 1988. "Missing-Data Adjustments in Large Surveys," Journal of Business & Economic Statistics (6:3), pp. 287–296.
Liu, C., Marchewka, J.T., Lu, J., and Yu, C.-S. 2005. "Beyond Concern - a Privacy-Trust-Behavioral Intention Model of Electronic Commerce," Information & Management (42:2), pp. 289–304.
Luhmann, N. 1979. Trust and Power. Chichester: Wiley.
Madlmayr, G., Langer, J., Kantner, C., and Scharinger, J. 2008. "Nfc Devices: Security and Privacy," Proceedings of the Third International Conference on Availability, Security, and Reliability, Los Alamitos, Calif: IEEE Computer Society, pp. 642–647.
Madsen, M., and Gregor, S. 2000. "Measuring Human-Computer Trust," Proceedings of the 11 th Australasian Conference on Information Systems, pp. 6–8.
Malhotra, N.K., Kim, S.S., and Agarwal, J. 2004. "Internet Users' Information Privacy Concerns (Iuipc): The Construct, the Scale, and a Causal Model," Information Systems Research (15:4), pp. 336–355.
Mann, A., and Prein, J. 2010. "Mobile Loyalty Programs," in Handbook of Research on Mobile Marketing Management, K. Pousttchi and D.G. Wiedemann (eds.). Hershey, PA: Business Science Reference, pp. 362–380.
Mayer, R.C., Davis, J.H., and Schoorman, F.D. 1995. "An Integrative Model of Organizational Trust," The Academy of Management Review (20:3), pp. 709–734.
McKnight, D.H. 2005. "Trust in Information Technology," in The Blackwell Encyclopedia of Management, C.L. Cooper, C. Argyris and W. Starbuck (eds.). Malden, MA: Blackwell Pub., pp. 329–331.
McKnight, D.H., Carter, M., Thatcher, J.B., and Clay, P.F. 2011. "Trust in a Specific Technology: An Investigation of Its Components and Measures," ACM Transactions on Management Information Systems (2:2), pp. 1–25.
McKnight, D.H., and Chervany, N.L. 2002. "What Trust Means in E-Commerce Customer Relationships: An Interdisciplinary Conceptual Typology," International Journal of Electronic Commerce (6:2), pp. 35–60.
McKnight, D.H., Choudhury, V., and Kacmar, C. 2002. "Developing and Validating Trust Measures for E-Commerce: An Integrative Typology," Information Systems Research (13:3), pp. 334–359.
McKnight, D.H., Cummings, L.L., and Chervany, N.L. 1998. "Initial Trust Formation in New Organizational Relationships," The Academy of Management Review (23:3), pp. 473–490.
Moorman, C., Deshpandé, R., and Zaltman, G. 1993. "Factors Affecting Trust in Market Research Relationships," Journal of Marketing (57:1), pp. 81–101.
Muir, B.M. 1987. "Trust between Humans and Machines, and the Design of Decision Aids," International Journal of Man-Machine Studies (27:5-6), pp. 527–539.
Muir, B.M. 1989. Operators' Trust in and Use of Automatic Controllers Supervisory Process Control Task. Doctoral Dissertation, University of Toronto, Canada.
Park, J., and SuJin, Y. 2006. "The Moderating Role of Consumer Trust and Experiences: Value Driven Usage of Mobile Technology," International Journal of Mobile Marketing (1:2), pp. 24–32.
Paul, I., Rose, B., and Cassavoy, L. 2011. "Smartphone Spying Reality Check," PC World (29:7), pp. 13-15.
Paulhus, D.L. 2002. "Socially Desirable Responding: The Evolution of a Construct," in The Role of Constructs in Psychological and Educational Measurement, H.I. Braun, D.N. Jackson, D.E. Wiley and S. Messick (eds.). Mahwah, NJ: L. Erlbaum, pp. 49–69.
Pavlou, P.A. 2003. "Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with the Technology Acceptance Model," International Journal of Electronic Commerce (7:3), pp. 101–134.

Petter, S., Straub, D., and Rai, A. 2007. "Specifying Formative Constructs in Information Systems Research," MIS Quarterly (31:4), pp. 623–656.
Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., and Podsakoff, N.P. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," Journal of Applied Psychology (88:5), pp. 879–903.
Prein, J. 2011. Konsumentenseitige Akzeptanz Mobiler Dienste in Kundenkartenprogrammen: Theoriegeleitete Modellentwicklung Und Empirische Überprüfung, (1 ed.). Wiesbaden: Betriebswirtschaftlicher Verlag Gabler.
Resatsch, F. 2010. Ubiquitous Computing: Developing and Evaluating near Field Communication Applications, (1 ed.). Wiesbaden: Gabler.
Rifon, N.J., LaRose, R., and Choi, S.M. 2005. "Your Privacy Is Sealed: Effects of Web Privacy Seals on Trust and Personal Disclosures," Journal of Consumer Affairs (39:2), pp. 339–362.
Ringle, C.M., Sarstedt, M., and Straub, D.W. 2012. "A Critical Look at the Use of Pls-Sem in Mis Quarterly," MIS Quarterly (36:1), pp. iii–xiv.
Ringle, C.M., Wende, S., and Will, A. 2005. "Smartpls 2.0." from http://www.smartpls.com
Rousseau, D.M., 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 (23:3), pp. 393–404.
Rubin, D.B. 1976. "Inference and Missing Data," Biometrika (63:3), pp. 581–592.
Rubin, D.B. 1986. "Statistical Matching Using File Concatenation with Adjusted Weights and Multiple Imputations," Journal of Business & Economic Statistics (4:1), pp. 87–94.
Rubin, D.B. 1987. Multiple Imputation for Nonresponse in Surveys. New York: Wiley.
Salisbury, W.D., Pearson, R.A., Pearson, A.W., and Miller, D.W. 2001. "Perceived Security and World Wide Web Purchase Intention," Industrial Management & Data Systems (101:4), pp. 165–177.
Shankar, V., and Balasubramanian, S. 2009. "Mobile Marketing: A Synthesis and Prognosis," Journal of Interactive Marketing (23:2), pp. 118–129.
Shilton, K. 2009. "Four Billion Little Brothers?," Communications of the ACM (52:11), pp. 48–53.
Shin, D.-H. 2010. "Modeling the Interaction of Users and Mobile Payment System: Conceptual Framework," International Journal of Human-Computer Interaction (26:10), pp. 917–940.
Siau, K., and Shen, Z. 2003. "Building Customer Trust in Mobile Commerce," Communications of the ACM (46:4), pp. 91–94.
Söllner, M., Hoffmann, A., Hirdes, E.M., Rudakova, L., Leimeister, S., and Leimeister, J.M. 2010. "Towards a Formative Measurement Model for Trust," in 23. Bled Econference Etrust: Implications for the Individual, Enterprises and Society (Bled) 2010. Bled, Slovenia: pp. 65–79.
Söllner, M., Hoffmann, A., Hoffmann, H., and Leimeister, J.M. 2012a. "Trust Support for Ubiquitous Computing Systems," Journal of Business Economics (82:Special Issue 4), pp. 109–140.
Söllner, M., Hoffmann, A., Hoffmann, H., Wacker, A., and Leimeister, J.M. 2012b. "Understanding the Formation of Trust in It Artifacts," Proceedings of the 33. International Conference on Information Systems, Orlando Florida, USA.
Srinivasan, S.S., Anderson, R., and Ponnavolu, K. 2002. "Customer Loyalty in E-Commerce: An Exploration of Its Antecedents and Consequences," Journal of Retailing (78:1), pp. 41–50.
Stewart, K.J. 2003. "Trust Transfer on the World Wide Web," Organization Science (14:1), pp. 5–17.
Stone, M. 1974. "Cross-Validatory Choice and Assessment of Statistical Predictions," Journal of the Royal Statistical Society. Series B (Methodological) (36:2), pp. 111–147.
Tan, Y.-H., and Thoen, W. 2000. "Toward a Generic Model of Trust for Electronic Commerce," International Journal of Electronic Commerce (5:2), pp. 61–74.
van Buuren, S. 2007. "Multiple Imputation of Discrete and Continuous Data by Fully Conditional Specification," Statistical Methods in Medical Research (16:3), pp. 219–242.
Vance, A., Elie-dit-Cosaque, C., and Straub, D.W. 2008. "Examining Trust in Information Technology Artifacts: The Effects of System Quality and Culture," Journal of Management Information Systems (24:4), pp. 73–100.
Varnali, K., and Toker, A. 2010. "Mobile Marketing Research: The-State-of-the-Art," International Journal of Information Management (30:2), pp. 144–151.
Wang, W., and Benbasat, I. 2005. "Trust in and Adoption of Online Recommendation Agents," Journal of the Association for Information Systems (6:3), pp. 72–101.
Wang, Y.D., and Emurian, H.H. 2005. "An Overview of Online Trust: Concepts, Elements, and Implications," Computers in Human Behavior (21:1), pp. 105–125.

Wetzels, M., Odekerken-Schröder, G., and van Oppen, C. 2009. "Using Pls Path Modeling for Assessing Hierarchical Construct Models: Guidelines and Empirical Illustration," MIS Quarterly (33:1), pp. 177–195.

Wold, H.O.A. 1982. "Soft Modeling: The Basic Design and Some Extensions," in Systems under Indirect Observation, K.G. Jöreskog and H.O.A. Wold (eds.). Amsterdam: North-Holland, pp. 1–54.

Wright, C., and Sparks, L. 1999. "Loyalty Saturation in Retailing: Exploring the End of Retail Loyalty Cards?," International Journal of Retail & Distribution Management (27:10), pp. 429–440.

Wu, G.M. 2000. The Role of Perceived Interactivity in Interactive Ad Processing. Doctoral Dissertation, The University of Texas at Austin.

Xu, H., Teo, H.-H., and Tan, B.C.Y. 2005. "Predicting the Adoption of Location-Based Services: The Role of Trust and Perceived Privacy Risk," Proceedings of the 26. Iternational Conference on Information Systems, pp. 897–910.

Yenisey, M.M., Ozok, A.A., and Salvendy, G. 2005. "Perceived Security Determinants in E-Commerce among Turkish University Students," Behaviour & Information Technology (24:4), pp. 259–274.

Zhou, T. 2011. "The Effect of Initial Trust on User Adoption of Mobile Payment," Information Development (27:4), pp. 290–300.

Zuboff, S. 1988. In the Age of the Smart Machine: The Future of Work and Power. New York: Basic Books.