

# Influence of Trust Assurances in Mobile Commerce Applications on the Formation of Online Trust

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**Abstract.** In this paper we investigate the influence of Trust Assurances in Mobile Commerce Applications on the formation of Online Trust. In comparison to existing measuring approaches we therefore developed a more detailed approach of capturing Online Trust. We carried out a study in which Online Trust was captured after an initial interaction with an unknown business partner in form of a fictional Mobile Commerce Application. The generated quantitative and qualitative data allowed for conclusions concerning the formation of Online Trust as well as the influence of Trust Assurances.

## 1 Introduction

In [1] Online Trust is defined as *an attitude of confident expectation in an online situation of risk that ones vulnerabilities will not be exploited*. According to [2] trust in online-environments is considered to be relevant to business success especially in the context of business-to-customer (B2C) relations. Beyond that we strongly agree with Riegelsberger et al. [3], that beside refocusing from the objective to *increase user's trust perceptions to enable correct trust decisions*, designing systems in order to allow for sound trust decisions could enhance an organization's socio-technical systems for more productivity and adaptability (cf. [4]). We consider Trust Assurances as potentially being able to contribute to such sound trust decisions.

Trust Assurances, issued by trustworthy entities, are controversially discussed in literature as possible key factors for the formation of online trust. Results found in literature span from a *higher online transaction expectations and stronger intent to purchase online* [5], to *no relationships between assurance seals and trust in e-retailers* [6].

The current prevalence of Smartphones and their ever increasing capabilities lead to a general movement of online activity towards mobile scenarios. In particular, this compromises commercial online activity, usually described as Mobile Commerce. Formation of Online Trust and usage of Trust Assurances in mobile commerce applications is complicated by additional parameters like volatile usage environments and the limited display capabilities of mobile devices.

This paper is organized as follows: we introduce a new conceptualization of capturing Online Trust, then report on a preliminary study we carried out, applying our approach of capturing Online Trust to given web-based systems. Subsequently we introduce the study environment and process we used for exploring the effect of Trust Assurances in Mobile Commerce Applications on the formation of Online Trust. Finally, we discuss the results and draw some conclusions.

## 2 Related Work

In [1] a high-level model of Online Trust is introduced. It distinguishes between external and internal factors contributing to Trust (as an attitude). External factors are *characteristics of the trustor*, the *object of trust* (more detailed: it's *navigational architecture*, *interface design elements*, *information content accuracy*, *seals of approval from organizations*) and the *situation* (including e.g. *the level of risk*). Internal factors within this model are: perceived *credibility*, perceived *ease of use* and perceived *risk*.

In [7] a measuring approach of Online Trust based on the three internal factors: *perceived Credibility*, *Perceived Ease of Use*, and *Risk* was developed.

[8] presented an extensive literature review on antecedents of trust in online transactions and services. They described three clusters of antecedents: customer/client-based, website-based, and company/organization-based antecedents. Customer/client-based antecedents contain propensity to trust, experience and proficiency in internet usage.

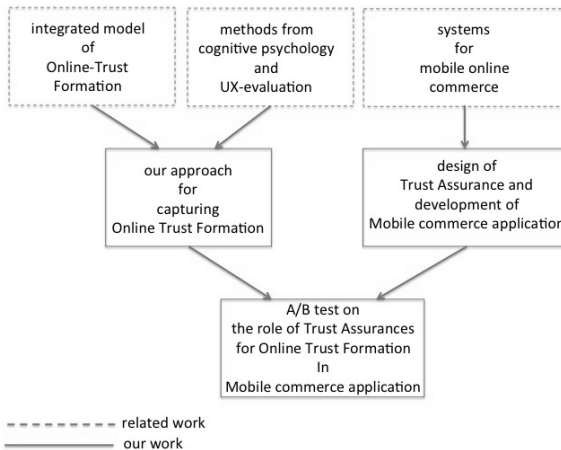
Zhang & Zhang [9] described a similar but more comprehensive approach by introducing Trust stages with Trust factors associated with each stage. They categorized the *antecedents* into: Trustor Factors, Trustee Factors, Trustee Website Factors, System Trust (subdivided into Situational Normality, Structural Assurance and Facilitating Conditions), Interaction and External Environmental Factors. In addition they integrated the *belief-attitude-intention-behavior* logic of the theory of planned behavior (TPB) [10]. The resulting Integrated Model allows for dynamic development of trust by being iterative. The final two-stage based factor explanation is composed of the above mentioned *antecedents* and the *belief, attitude, intention and behavior* logic. Additionally, the Model distinguishes between two stages (*initial trust stage* and *committed trust stage*) to show the influences of the factors in different stages of trust formation (see <https://d1.dropbox.com/u/2653880/HCI2013/InfluencingFactorsTable.pdf>).

Vermeeren et al. described a multi-year effort of collecting user experience evaluation methods [11] resulting in a list of 96 evaluation methods, which were categorized regarding scientific quality, scoping, practicability, utility and specificity. We analyzed the list with respect to our approach to capture online Trust.

In this paper we consider Online Trust as a subset of user experience, defined as *a person's perceptions and responses that result from the use or anticipated use of a product, system or service* [12]. The followings steps address the antecedents that form and influence online trust (as an experience) and that result from the use and anticipated use.

### 3 Methodology

In this paper we investigate the influence of Trust Assurances in Mobile Commerce Applications on the formation of Online Trust. Existing trust models for eCommerce focus on Online Trust in general. Therefore, we decided to develop a more detailed approach for capturing Online Trust in Mobile commerce Applications. Our approach utilizes the Integrative Online-Trust Model by Zhang & Zhang (see [9]) by applying User Experience capturing methods from [11] to the model's stages and factors, contributing to a resulting Trust Experience of humans while interacting with web-based systems. Based on this we designed an exploratory, descriptive study in order to investigate the influence of Trust Assurances in Mobile Commerce Applications on the formation of Online Trust (see 1).



**Fig. 1.** Overview of our empirical study on the influence of Trust Assurances in mobile commerce applications on the formation of Online Trust

In our setup, Online Trust was captured after an initial interaction with an unknown business partner in form of a fictional Mobile Commerce Application based on the methodology described above. We expect that the resulting quantitative and qualitative data will allow for conclusions concerning the formation of Online Trust as well as the influence on Trust Assurances. In the first step we carried out a preliminary study (see 3.2) and then applied the resulting approach to a mobile eCommerce-system in order to investigate the role of Trust Assurances in terms of Online Trust formation (see 4).

### 3.1 Conceptualization

Our selected approach from [9] allows us to consider:

- which factors contribute to Online-Trust formation,
- how the Online-Trust formation process is related to a complete interaction cycle and
- what happens to Online-Trust when reusing an online-system.

We operationalized the *factors* of the Trust model [9] according to the semiotic approach of [13] to allow for the capturing of data related to Trust.

For the operationalization of the mentioned Online-Trust *factors* we used definitions of these factors from either [9] itself or related work. In the rare cases where no definition was found we performed a semantic analysis. Additionally we incorporated the stages from [9] according to [11] by dividing the questionnaire into three parts: questionnaire 1 - general information independent of the stages, questionnaire 2 - after an initial trust formation process, questionnaire 3 - after the overall service. The particular factors captured by each part are shown in figure 2.

Questionnaire 1 is captured independently of user interaction with the technical system, as the factors considered are independent of the usage of a product, system or service and thus independent of the stages. They are also considered to be quite stable concerning the formation of online trust and the two stages.

Questionnaire 2 needs to be captured directly after the initial trust formation process and before a first purchase. The data assessed here correlates to the initial trust formation phase. Questionnaire 3 needs to be captured after the whole service is completed. It correlates to the committed trust stage. A detailed view of the resulting conceptualization is available via <https://dl.dropbox.com/u/2653880/HCI2013/Conceptualisation.pdf>.

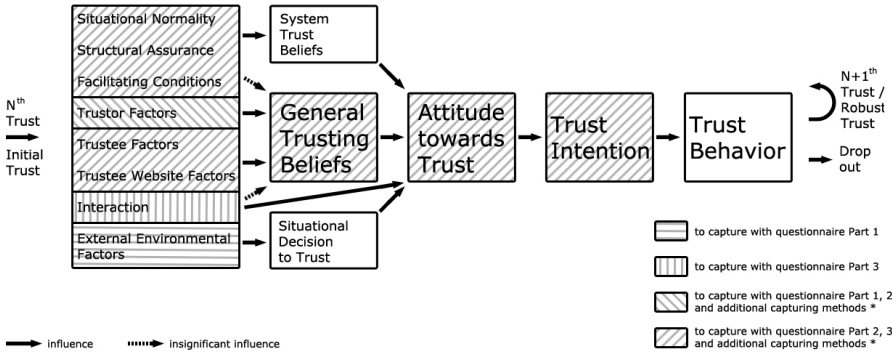
We revised the design of the capturing procedures in terms of completeness, construct validity and reliability. Since the majority of the capturing procedure delivers qualitative data, we decided to enrich the capturing process by video-audio logging and eye-tracking. Additionally, the laddering technique for a summative interview at the end of the human-system interaction process was applied. In our opinion these data potentially allow for the deduction of a cause-effect relationship in terms of a given User Experience.

Figure 2 illustrates the assignment of capturing procedures to the integrated model of online trust formation. The capturing process starts with questionnaire 1. Subsequently the participants perform predefined tasks using the interactive system, followed by questionnaire 2. Questionnaire 3 is used after experiencing the complete service (e.g. purchased product has arrived at the customer and payment has been completed).

### 3.2 Preliminary Study

We conducted a preliminary study in order to assess the practicability of our approach. We invited 26 subjects covering a selected sociodemographical range

\* additional capturing methods: video-/audio-capturing, eye-tracking, key-event-logging, screen-capturing



**Fig. 2.** Assignment of capturing procedures to the integrated model of online trust formation

between the ages of 18 to 62 and with different levels of computer literacy and online-purchase experience levels. The preliminary study was carried out as an in-vitro study using the usability-laboratory of our institute. We instructed the subjects on the background and process of our study and used fictional scenarios and existing real-world web sites. In order to ensure that the subjects had substantial interaction with the interactive systems before they were confronted with questionnaire 2, the subjects were asked to carry out certain tasks. The tasks were designed to capture the factors described in the initial trust stage and concluded with a purchase process. Questionnaire 2 was started right before the subjects were about to finalize their order (pushing the submit button), to capture the subject’s attitude towards trust factors and not their resulting behavior. The preliminary study did not contain questionnaire 3 owing to the fact that the whole service needed to be experienced to answer the questions. Note that the preliminary study was conducted with german participants with the questionnaire in german language.

### 3.3 Results of the Preliminary Study

The results of this preliminary study showed that significant insight on the formation of Online Trust could be gained from the data resulting from the capturing procedure in order to better understand why users trust or don’t trust interactive systems. It turned out that single *factors* could affect the resulting Trust evidently. To give an example: in one of the websites in use (Online Wine-Shop) an inconsistency in vintage between the textual and the visual label informations had a significant impact on the model-factor Perceived Information Quality. This significantly effected the resulting Trust formation negatively (distrust) for almost all subjects.

Overall: since we could draw on well established definitions for the majority of the *factors* (and the definitions often included indicators themselves) we rate the validity to be high. The questionnaires were found to be practicable, feasible in due time, the wording was understood by the subjects and qualitative and quantitative data from the capturing procedure (e.g. fixations from eye-tracking to verbal statements or comments within the questionnaire or the laddering technique) amounted to a reasonably consistent overall picture.

The captured data allowed for exploring causes and effects on the formation of Online Trust based on the features of the web-based system, the individual characteristics of the users (more precisely: their perception of the system's features) and the context of interaction (stages as well as iterated usage).

## 4 Approach to Integrate Trust Assurances in a Mobile Commerce Applications

We decided to use a third-party assurance because the intended app represents an unknown and unfamiliar vendor. [14] states that a "third-party assurance is unnecessary for vendors with a high reputation, while unknown vendors can enhance consumers' purchasing likelihood by obtaining EC third party assurance".

In [15] Moores writes "However, in order for privacy seals to be effective, B2C Web sites must display them more prominently so that online consumers can begin to recognize these graphic images and understand their function". Kim and Benbasat describe different *assurance delivery modes* in which a Trust Assurance can be presented [16]. They suggest the mode *easy access and easy return*, where a hyperlink is provided to access the Trust Assurance. The hyperlink opens a pop-up window. Minimal cognitive effort (such as one click) is required.

The Trust Assurance was integrated as can be seen under (see <https://dl.dropbox.com/u/2653880/HCII2013/MobileCommerceApp-TrustAssurance.jpg>). Based on the conventions of Android and similar mobile user interfaces this integration displays the possibility to access additional information on the Trust Assurance through direct manipulation. The visual representation of the seal was designed using the following steps:

- we analyzed existing and established Seals in order to develop design dimensions (i.e. rows of the morphological matrix) of a morphological matrix,
- we then created sketches for each separate design dimension and based on this, synthesized a final resulting design solution.

The final design of the Seal is shown in Figure 4. The color was used to implement a visual traffic light metaphor.

### 4.1 Execution of the Main Study

The questionnaires developed for Part 1 and Part 2 (see 3.1) were applied via structured interviews. The study was carried out with a group of 24 subjects.

official/ statutory authority												
e-commerce/ online shop/ virtual trade												
internet/ modern technology		lower case	english language	www								
security/ encryption							https					
mobile/ app												
certification/ verification/ process- description	certificate	checked	seal			§	guarantee	✓	May 2012			
color												
texture	flat paper	realistic 3D										

**Fig. 3.** Morphological Matrix of the Design Suggestion of a Trust Assurance Seal (translated in english)



**Fig. 4.** Seal of the Trust Assurance

Half of the subjects used the app without the Trust Assurance. Regarding the internet and online purchase experiences and the usage of a smartphone the group showed a high heterogeneity. Detailed data are presented in <https://d1.dropbox.com/u/2653880/HCI2013/QuantitativeResultsTable.pdf>.

The app as an interaction tool ran within an emulator of the Android operating system to allow the usage of a stationary eye-tracking system of the lab. The process was structured as follows: At first the task and further information were given to the subjects by the conductor of the study. The subjects received the following informations: 1) information about the task: completing the purchase of a magazine and getting an impression of the business partner; 2) financial information: the app is fictional, the subjects will not be required to pay real money and personal data is not stored; 3) information on usage of the IT environment, e.g. on touch gestures: touch gestures, navigational elements to use, input options to use, 4) information on available time: note that there is no time limit. We started with Part 1 (general information). After completing the purchase process the interview started with Part 2, with the questions referring

to initial trust formation during interaction. Part 3 was not used in this study as this part is related to a summative assessment of the Trust attitude, *after the whole service is experienced* (i.e. purchased product arrived with the customer).

## 5 Results and Discussion

We gathered quantitative and qualitative data using different capturing procedures (questionnaires, laddering technique, eye-tracking). A detailed table of the results is accessible via <https://dl.dropbox.com/u/2653880/HCII2013/ResultsMainStudy.pdf>

The qualitative data proved to be crucial for an understanding of the formation of Online Trust, because they contain background informations and thoughts behind the ratings of the subjects.

The Table QuantitativeResultsTable.pdf (under the same URL-prefix as above) shows predominantly quantitative data. It distinguishes between the group of subjects which used the app version including the Trust Assurance ("results with TA", group 1) and the group which used the app version without the Trust Assurance ("results without TA", group 2).

The results from the questionnaire Part 1 show that we succeeded in dividing the subjects into equal groups concerning the attributes. T-tests showed that there is no significant difference for each *factor* at a level of significance of  $\alpha = 0.05$ . The demographic factors, the experiences of purchasing online, the knowledge of the internet, the technical environment and the general attitude towards trust and risk are quite similar in both groups.

The results concerning the interaction (questionnaire Part 2) show clearer differences. The following *factors* were higher rated by group 1 (with TA) than by group 2 (without TA). T-tests showed a significance for the *factor Perceived Security* at a level of significance of  $\alpha = 0.05$ . There was no significance for other *factors*. Concerning the Trustworthiness of the Business Partner (*Belief - Trustee is benevolent, of Integrity and Capable*) 16.7% of the subjects of group 2 (without TA) said that their business partner is not trustworthy. In contrast, 100% of the subjects of group 1 (with TA) said that their business partner is trustworthy. In addition, the *factor Attitude - The Trustee is Exchangeable* was 0.5 lower rated by group 1 (Business Partner is less Exchangeable). However, the result of the resulting intention to purchase showed that group 2 had a higher intention (difference: 0.17). Additionally, the subjects of group 1 rated the *factor Time Pressure* 0.25 points higher.

Due the inherent complexity of the term Trust, the quantitative data should not be interpreted without the consideration of the qualitative data. This is particularly true for *intention to purchase* which is influenced by subjective perceptions of all prior factors and thus represents a summative assessment. Qualitative data (subjects statements) reveal that factors may have some impact on other factors as well. The following link shows different reasons mentioned by the



subjects for the specific extent of the formation of Online Trust: <https://dl.dropbox.com/u/2653880/HCII2013/QualitativeResultsTable.pdf>. A detailed description of the individual reasons is accessible via <https://dl.dropbox.com/u/2653880/HCII2013/ResultsMainStudy.pdf>.

The results show that the individual perceptions and individual assessments of the subjects are crucial for the extent of formation of Online Trust.

## 6 Conclusion and Future Directions

In this paper we introduced an Online Trust capturing approach offering a high level of detail. This approach (questionnaires related to the model's *stages* and *factors*, laddering technique, eye-tracking) allows for model-consistent interpretation of a resulting Online Trust attitude in terms of causes and effects. Based on the results of our study and in contrast to other publications, we prefer to use the term capturing instead of measuring. The term measuring in our opinion indicates a degree of precision, which is impossible to achieve when dealing with an attitude (Trust).

An approach to integrate Trust Assurances in Mobile Commerce Applications was developed. The Seal was integrated as an entry of the tab menu presented within a subarea of the app. On this basis we investigated the influence of Trust Assurances in Mobile Commerce Applications on Online Trust. The resulting quantitative and qualitative data allowed for conclusions concerning the formation of Online Trust as well as the influence of Trust Assurances.

The usage of the app in the study showed that 83.3% of the subjects who were given the option of using the Trust Assurance Tab did so. In addition, qualitative data showed that the presentation of the Trust Assurance was recognized positively by some subjects.

Findings regarding the perception of the Trust Assurance during an interaction with a Mobile Commerce Applications were based on data generated by the use of an eye-tracking system during the interaction of the subjects with the app. The analysis of the data showed that all subjects in group 1 (with TA) looked at the tab of the Trust Assurance at least once. Furthermore, the analysis showed that 16.7% of the subjects neither used the tab of the Trust Assurance nor the information tab (imprint, general terms and conditions, privacy statement). Detailed informations are available via the links mentioned above.

Results show that the influence of Trust Assurances can be explicit and/or implicit. The quantitative data indicates that there is a tendency of an implicit influence. Especially the *factor* Perceived Security, which showed a significant difference in the ratings of the subjects supports this interpretation. However, the individual experiences and attitudes as well as the individual aspects that are considered important by the subjects which are conscious and were explicitly mentioned during the interview, are crucial for the formation of Online Trust. We interpret the results according to this more or less obvious statement: The greater the importance the subject ascribes to Trust Assurance in general, the greater the impact of its presence or in fact absence on the formation of Online Trust.

In future, implicit (and subconscious) influences on the formation of Online Trust should be investigated, based on a larger sample size. We will also focus on *in-vivo* contexts of a mobile application by using eye-tracking glasses.

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