Implications of Trust and Usability on E-Commerce Adoption

Padmali Manesha Peiris
( Corresponding Author: manesha@gmail.com &
Dhananjay Kulkarni
School of Computing
Asia Pacific Institute of Information Technology
Colombo, Sri Lanka

Colvin R. de Silva Mawatha
Colombo, Sri Lanka

ABSTRACT
Although e-commerce has many benefits for businesses, many organizations struggle with low consumer adoption rates. Research has shown that a user’s intention to conduct a transaction online is influenced by two critical factors: the user’s perception of the ease of use of the technology, and the user’s perception of trust regarding the online merchant. Since the web interface is the main mode of communication between the consumer and the merchant, it is critical that the interface inspire user trust in the merchant and facilitate ease of using the technology. This study explores ways of integrating affective and cognitive trust technologies with human/computer interaction so as to achieve this purpose. In order to formulate a model for encouraging user adoption of e-commerce, this study forms a connection between the core constructs of the technology acceptance model (TAM), perceived ease of use, and perceived usefulness and the constructs of usability and trust. The proposed model was developed based on findings from two experiments conducted during the study involving two sets of sample webpages – one set incorporating web usability guidelines and trust indicators identified in the literature, and one set intentionally violating those principles. The results, incorporated in the model, indicate that encompassing the principles improves the user’s emotion with regard to e-commerce adoption.

Keywords: E-commerce, trust, usability, human/computer interaction, e-commerce adoption
1. INTRODUCTION

Many organizations are eager to integrate Internet technology into their businesses. One of the more prominent applications of this technology is the use of e-commerce. Although there are many potential benefits, such as market growth, easy access, and cost reduction, online businesses face many challenges in successfully incorporating e-commerce. One of the major challenges identified by researchers is the low adoption rates of e-commerce websites by consumers.

Research by various authors under various contexts suggests that several factors play a fundamental role with regard to consumer adoption of e-commerce websites and consumer reluctance to conduct a transaction with an online merchant. These factors include perception of the ease of use (PEOU), perceived usefulness (PU), security risk (SR), social norm (SN), willingness to disclose personal information (WDPI), and trust [Lee et al., 2001; Pavlou & Chai, 2002; Gefen et al., 2003; Klopping and McKinney, 2004; Tang and Chi, 2005; Maditinos et al., 2007; Li and Huang, 2009; Dennis et al., 2009; Usoro, 2010; Ahmed, 2011; Ayo et al., 2011].

The motivation for conducting the current study arose from our prior research on factors affecting the adoption of e-commerce among Sri Lankan consumers [Peiris and Kulkarni, 2015]. The prior study revealed that the constructs PEOU, PU, and trust play a prominent role in user adoption of e-commerce. This study extends those findings by exploring ways to improve PEOU, PU, trust, and willingness to disclose personal information and ways to integrate social norms while suppressing the perceived security risk of doing a transaction online.

2. BACKGROUND

The literature on technology adoption in e-commerce reveals that the instrument through which the transaction occurs plays a vital role in the success of user adoption. For example, the theory of reasoned action (TRA) by Klopping and McKinney [2004] is based on the principle that beliefs influence attitudes, which leads to the intention to use and finally to the actual performance of the behavior. In this case, the attitude and beliefs are influenced by what the user perceives via the instrument.

Dennis et al. [2009] apply TRA in the context of e-commerce and use the following factors as those that influence attitude and belief: perception of the e-retailer’s image, e-interactivity, ease of navigation, web atmospherics, trust,
past experience, and learning about the website. All of these factors rely heavily on the user interface of the medium.

Klopping and McKinney [2004] state that the theory of planned behavior (TPB) is an expansion of TRA that introduces the construct perceived behavioral control. According to Ajzen [1991], the construct was added in order to overcome a weakness in the original model and to indicate the individual’s perception that he or she has control over performing the action, or not. Pavlou and Chai [2002] incorporated the following as factors that influence perception of perceived control in the transaction: trust, attitude, and subjective norm.

The technology acceptance model (TAM) is built on the fundamental concept of TRA and TPB, focusing on the “belief – attitude – intention” relationship [Park et al., 2004]. According to Park et al. [2004], the main purpose of TAM is to predict the consumer’s acceptance of technology. Application of this model is one of the most popular in the area of e-commerce adoption. Table 1 identifies the factors often taken into consideration in application of TAM.

As indicated, the factors PEOU, PU, trust, security, quality, and social influence play a prominent role. This means that, in order to create a positive perception in the consumer’s mind that can be translated into action, the user interface of the e-commerce website must effectively communicate all of these factors. The challenge facing website designers is how to achieve this goal.

Although various practices and principles have been proposed in domains such as usability and security, there is little evidence regarding the degree to which these factors influence the constructs listed above. One focus of the current study, therefore, is to identify driving factors that can be adopted in the design of e-commerce websites to support PEOU, PU, and trust. The current study, therefore, first investigates the area of usability in order to identify concepts that can be adopted to enhance usability, and, second, explores trust constructs that can be used to communicate trustworthiness to the consumer.
<table>
<thead>
<tr>
<th>Study</th>
<th>Variables Considered</th>
</tr>
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</table>
| Lee et al. [2001]            | Perceived risk in the context of transaction  
|                              | Perceived risk with products/services  
|                              | Perceived ease of use (PEOU)  
|                              | Perceived usefulness (PU) |
| Gefen et al. [2003]          | Trust  
|                              | Perceived ease of use (PEOU)  
|                              | Perceived usefulness (PU)  
|                              | Calculative-based, institutional-based structural assurance  
|                              | Institution based-situation normality  
|                              | Knowledge-based familiarity |
| Gefen et al. [2003]          | Trust  
|                              | Familiarity  
|                              | Perceived ease of use (PEOU) (indirect)  
|                              | Perceived usefulness (PU)  
|                              | Disposition to trust (indirect)  
| Klopping and McKinney [2004]| Task technology fit (TTF)  
|                              | Perceived ease of use (PEOU)  
|                              | Perceived Usefulness (PU)  
|                              | Behavioral Intention |
| Tang and Chi [2005]          | Perceived ease of use (PEOU)  
|                              | Perceived usefulness (PU)  
|                              | Trust |
| Maditinos et al. [2007]      | Perceived risk  
|                              | Perceived ease of use (PEOU)  
|                              | Perceived usefulness (PU)  
|                              | Attitude toward use |
| Li and Huang [2009]          | Perceived ease of use (PEOU)  
|                              | Perceived usefulness (PU)  
|                              | Perceived risk  
|                              | Behavioral intention |
| Usoro [2010]                 | Perceived ease of use (PEOU)  
|                              | Perceived usefulness (PU)  
|                              | Trust  
|                              | Task technology fit (TTF)  
|                              | Behavioral intention to use |
| Ahmed [2011]                 | Perceived reputation of e-shop  
|                              | Perceived trust of e-shop  
|                              | Perceived ease of use (PEOU)  
|                              | Perceived usefulness (PU)  
|                              | Perceived familiarity with e-commerce  
|                              | Perceived security risk of e-transactions  
|                              | Income, education level, age |
| Ayo et al. [2011]            | Task technology fit (TTF)  
|                              | Perceived ease of use (PEOU)  
|                              | Perceived usefulness (PU)  
|                              | Trust  
|                              | Perceived risk |
3. LITERATURE REVIEW

This section includes a comprehensive review and discussion of the literature with regard to usability and trust.

3.1. Usability

According to Davis et al. [1989, cited by Bigne et al., 2010], PEOU affects human attitude through self-efficacy and instrumentality. Bandura [1993] defines self-efficacy as a user’s perception that he or she has the ability to reach a set goal by mastering a situation and producing a positive outcome. According to Davis [1989], PEOU influences PU, since the simplicity of a system has an influence on the user’s ability to produce positive results. Venkatesh and Davis [1996, cited by Holden and Randa, 2011] state that a customer’s self-efficacy is a determinant of PEOU and PU.

Nielsen [1993] defines usability and utility as sub-components of usefulness. Usability is represented by learnability, efficiency, the ease of remembering, minimal errors, and the subjective pleasure of using the application. According to Davis et al. [1989, cited by Reeder et al., 2011], it is often difficult to draw a clear separation between issues related to usability and utility. McLaughlin and Skinner [2000] support the argument by stating that making a system usable to the user is a necessary precursor in making a system useful. For these reasons, usability is considered a core element in infusing both utility and usefulness into an e-commerce website.

According to Rowley [2002], the website’s design defines the site visitor’s e-experience. In an exploratory study, Nielsen [2001] states that e-commerce can be profitable if it controls expenses and is designed to improve usability such that fewer users are turned away. Nielsen [2001] further states that an e-commerce website, if designed according to these principles, can be superior to the traditional electronic catalog by improving the richness of the user’s experience.

Chandler and Hyatt [2003] found that the majority of e-commerce websites do not take into consideration how the customer uses a website; hence, the site is more database-driven than customer-driven, resulting in customer frustration and dissatisfaction. Chandler and Hyatt [2003] point out that an online store is not a traditional catalog or retail store, but a hybrid of both, and that factors such as navigation, channel of communication, customer interaction, and support play a vital role in the customer’s e-experience.
Nielsen [2011] states that, in order to attract and retain users, a website must include features such as support for different types of users, attractive content, improved search facility, and quick response time.

Based on these studies of usability, the following section presents an overview of usability factors and principles that can be incorporated into the successful design of an e-commerce website.

3.1.1. *Methods to Support Different Types of Users*

Smith and Salvendy [2007] and Trulock [2008] identify three categories of users who must be considered in the design of system interfaces: novice or first-time users, knowledgeable or intermittent users, and expert or frequent users. Narrowing the focus of a website to a specific user category is one of the major flaws of interface design, according to Shneiderman [cited by Smith and Salvendy, 2007]. Because of high exposure and availability, an organization’s target market includes users with varying knowledge and skill levels. To ensure maximum accessibility to its website, therefore, an organization must design systems that can be used by not only expert users, but also knowledgeable or intermittent and novice users. Nielsen [2011] identifies a number of methods that can be used to support the different categories of buyers on an e-commerce website. These methods are summarized in Table 2.

3.1.2. *Web Usability Guidelines*

One of the goals of the current study is to formulate a usability framework for the design of e-commerce websites. To facilitate the formulation of such a framework, we reviewed the literature to identify the principles for incorporating usability into web design. According to Ryan [2009, cited by Gunawardena, 2010], the majority of these design principles are catered toward system interface design, which may not be relevant to the design of interfaces hosted on the web. This issue has a tremendous impact on the design of web pages, since principles that may work well for stand-alone applications may not be feasible for interfaces running on the web.
<table>
<thead>
<tr>
<th>Categorization</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known item purchase</td>
<td><em>Degree to which the website enables the user to search for products that are well-known to the user</em></td>
</tr>
<tr>
<td></td>
<td>This type of user is somewhat similar to the “expert/frequent user” discussed by Smith and Salvendy [2007] and Trulock [2008]. The website, therefore, must cater to the level of urgency of the type of user.</td>
</tr>
<tr>
<td>Product recommendation</td>
<td><em>Degree to which the website allows the user to search and find products and services that best suit the user’s needs</em></td>
</tr>
<tr>
<td></td>
<td>Abbattista et al. [2002] relate this method to user modeling. They indicate that, although many websites use customer details to promote products and services, those that allow users to update their information and be selective of products and services have a high probability of gaining the user’s trust.</td>
</tr>
<tr>
<td>Bargain hunters</td>
<td><em>Customers with minimal brand loyalty, for whom the main driver of the purchase decision is price [Kidsontalks [2007]</em></td>
</tr>
<tr>
<td></td>
<td>Yahalom and Madnick [1999] define the bargain shopper as a user who aims to achieve “value for money.” Easy access to bargain details, therefore, will help attract such customers.</td>
</tr>
<tr>
<td>Those who browse for inspiration, and one-time shoppers</td>
<td><em>Customers who browse e-commerce web pages without an imminent objective, but instead look for products or services that attract their attention and then make impulsive purchases</em></td>
</tr>
<tr>
<td></td>
<td>Nielsen [2011] defines these customers as users who are not familiar with the site, but may shop within the site a few times. This definition is similar to that for “novice users,” as defined by Smith and Salvendy [2007] and Trulock [2008]. For users in this category, an extensive amount of support and help would be important.</td>
</tr>
</tbody>
</table>
3.1.3. Shneiderman’s Interface Design Principles

Shneiderman [cited by Kotzé, 2009] identifies eight generic usability principles referred to as the “8 Golden Rules of Interface Design.” These generic rules cater to interface design in general and do not contain any factors that are specific to web-based interface design. Following is a description of the eight rules.

- **Rule #1: Strive for consistency.** Nielsen [1993] states that novice users often do not learn the entire system before using it and will, therefore, begin to use the system as soon as they have learned a part of it. In view of this fact, web page consistency can facilitate user adoption. Shneiderman [cited by Kotzé, 2009] advises web designers to ensure a consistent sequence of actions, as well as consistency in terminology, commands, menus, and help and support in order to avoid confusion on the part of the user. According to Zuschlag [2010], designers who provide consistency based on their assumption of what the user may be expecting may sometimes end up providing conventional design principles that may compromise the user’s overall experience. Zuschlag [2010] further states that designers must be more aware of the interpretation of users and the degree to which they will recognize and interpret interface inconsistencies. To ensure internal consistency, each set of stimuli should be given a single use within the system.

- **Rule #2: Enable frequent users to use short cuts.** Nielsen [1993] states that, in addition to general learnability, there are several other interface elements that can push users to gain expertise in using an interface. One such element is the use of short cuts to enable expert users to perform tasks faster. Shneiderman [cited by Kotzé, 2009] states that short cuts can be incorporated into interface design with the use of abbreviations, function keys, and hidden commands to support the user’s need to accelerate his or her interaction with the web page. Louis [2011] states that ease of use can be increased by using clear error messages and feedback and by using conventional commands such as keyboard short cuts with which the user is already familiar. Lidwell et al. [2010] and Foraker Labs [2012] state that, if Fitt’s law is to be applied to the design of a web page, the designer should bear in mind that the larger the clickable area provided for links, the less precise the movement required of the user. A larger clickable area would help novice users and those with disabilities achieve efficiency.
• **Rule #3: Offer informative feedback.** According to Nielsen [1993], online help will assist in broadening the user’s knowledge about using the system. Parush and Parush [2004] state that online help should include embedded support and FAQ (frequently asked questions) than can convert user confusion to understanding about how interaction should be initiated and conducted on the website. Feedback should convey a clear connection between the system and the real world [Nielsen, 2005]. The terminology used should not be alien to the user and should be conveyed in a manner that is easy to understand.

• **Rule #4: Design dialog to yield closure.** As an extension of Rule #3, Shneiderman [cited by Kotzé, 2009] proposes that feedback should be designed in a manner that provides the user a sense of relief and a feeling of completeness.

• **Rule #5: Offer simple error handling.** Frese et al. [1991, cited by Nielsen, 1993] state that error messages not only highlight a situation that restricts the user from continuing his or her task with the system, but also provide opportunities to help the user to understand the system better. Nielsen [1993] states that, in order to ensure usability, error messages should be phrased in clear, precise language, should provide guidance on how the user can overcome the problem, and should be polite without intimidating the user. Shneiderman [cited by Kotzé, 2009] adds that the system should be designed so that it prevents any errors that can be made by the user. Nielsen [2005] agrees with this statement and notes that error prevention must be attained through careful design.

• **Rule #6: Permit easy reversal of actions.** According to Norman [2004], an error occurs when a designer fails to fully communicate to the user how a system should function. O'Meara [2012] states that a system must be designed so that it facilitates easy reversal of any errors that occur when the system is being used.

• **Rule #7: Support internal locus of control.** Shneiderman [cited by Kotzé, 2009] states that expert users need to feel that they are in control of the system. Thus, the system must be designed in such a way that the users are initiators of actions rather than respondents to actions performed by the system.
Rule #8: Reduce user’s short-term memory load. According to Allen and Eckols [1997], interfaces should be easy to use. One of the major techniques for ensuring this characteristic in an application is through the simplicity of the interface. The simplistic nature of an interface reduces the strain on a user’s memory. Miller [1956] states that an average user has the capability of storing up to 7+2 or 7-2 items in his short-term memory at one given time. User memory is an important factor in e-commerce solutions, especially where the user may be burdened by many options and controls that may cause the user to feel lost within the system. Allen and Eckols [1997] state systems should also consider possible vision impairments for some users. Content on the e-commerce web site should be easily readable not only by the segment of the market with perfect vision, but also by users with disabilities. According to Darren [2010], the content should also be easily scannable so as to allow users to filter out content with ease and limited time.

Leavitt and Shneiderman [2006] offer the following 14 guidelines that are more specifically focused on web interface design and usability.

- **Guideline #1: Provide useful content.** Nielsen [2011] recognizes that poor content is one of the key reasons for user failure. Leavitt and Shneiderman [2006] identify content as the most crucial part of web design. The design of the content should be such that it is engaging and relevant to the audience for whom the site is designed.

- **Guideline #2: Avoid pop-ups.** Ahmadi [2000, cited by Leavitt and Shneiderman, 2006] states that pop-up windows are distracting and irritating to the user. Schaffer and Sorflaten [1995] agree that the abuse of pop-up windows is an irritant and suggest that pop-ups be used wisely.

- **Guideline #3: Increase website credibility.** Fogg [2002] and Martin [n.d.] state that the trustworthiness and expertise of a website, often used to represent credibility, can be beneficial to organizations. According to Leavitt and Shneiderman [2006], some methods of incorporating credibility are: (1) provide a useful set of frequently asked questions (FAQ); (2) ensure that the website is structured in a logical manner; (3) provide citations and references for articles; (4) provide author’s credentials; (5) use a professional design for the website; (6) provide an archive of past content (where appropriate); (7) ensure that the site is as
up-to-date as possible; (8) provide links to credible outside sources and materials; and (9) ensure that the site is frequently linked to other credible sites.

- **Guideline #4: Reduce the user’s workload.** This factor is closely related to Rule #8 by Shneiderman [cited by Kotzé, 2009] with regard reducing the user’s short-term memory load. Moray and Butler [2000, cited by Zhang, 2009] discuss the use of mental models to support design. Nielsen [2010] states that mental models are often misused or confused, resulting in poor design, and suggests that the use of multiple-search options be avoided in order to prevent mental model mix-ups. Nielsen [2010] also states that drastic innovation in design can result in user misinterpretation and misconception of attributes within the session.

- **Guideline #5: Facilitate accessibility.** Nielsen [1997, 2010] discusses the need to facilitate fast load times on the web in order to support user requirements. Leavitt and Shneiderman [2006] suggest that a reduction in the number of bites per page may result in faster download times.

- **Guideline #6: Provide feedback.** Leavitt and Shneiderman [2006] state that feedback must be provided on occasions when the user must wait. They suggest that any processing that requires less than 10 seconds should be indicated by an hourglass and that any processing that requires 60 seconds or more should be indicated by a process indicator, with an auditory signal when the processing is completed.

- **Guideline #7: Use color wisely.** Leavitt and Shneiderman [2006] state that color should not be used as the only mode of conveying information on a website because many users have difficulty in differentiating colors. Vision or sight is one of the most important considerations in the design of web-based applications, as all content on the interface will depend solely on the user’s visual capabilities. The ranges of objects that can be viewed by a user are based on the brightness and color displayed on the interface [Trulock, 2008]. Stanicek [2009] states that only 85.5% of the total population has normal vision. Using content that excludes the remaining 14.5% would mean that the e-commerce website would lose that share of the potential market.
• **Guideline #8: Ensure home page accessibility.** The design of the home page of a website is of utmost importance. A well-constructed home page projects a positive first impression for the user [Leavitt and Shneiderman, 2006]. According to Nielsen [2003], the most common violations of home page design are: (1) failure to highlight what the site offers that is of value to the user and how the website differs from that of competitors; (2) failure to use a liquid layout that will enable users to adjust or resize browser windows; (3) failure to distinguish visited links from others; (4) failure to use graphics that provide content rather than just being decorative; (5) failure to use taglines that reflect the purpose of the organization/business; (6) failure to provide access to archived content of importance; and (7) failure to provide active recursive links to the home page. Leavitt and Shneiderman [2006] suggest also: (1) that users should be able to access the home page from any other page; (2) that all major options should be clearly visible on the home page; (3) that the length of the home page should be reduced; and (4) that changes to the webpage should be announced.

• **Guideline #9: Avoid cluttering.** Spath et al. [2007] discuss the use of auditory elements in the interface to avoid cluttering and to avoid the load on the visual channel. Leavitt and Shneiderman [2006] state that excess cluttering of an interface results in degradation of website performance. They suggest the following solutions to overcome the problem: (1) maintain clickable items in a cluster closer to the top of the page; (2) prioritize content on the page; (3) place the most important content higher on the screen and the least important at the lower part of the interface; (4) optimize visual density by positioning content with the use of spare area; and (5) use consistent alignment and structure to help the user to compare products/services without having to remember one while going to another page.

• **Guideline #10: Provide navigation options.** Shelly et al. [2009] state that user-controlled navigation allows the user to navigate the website without being restricted by the designer’s idea of how the user should navigate the site. Kalbach [2007] states that navigation affects website credibility, encouraging users to do as they please within the website. Leavitt and Shneiderman [2006] provide the following guidance for better navigation design: (1) provide navigation options, including the ability to go back to
Guideline #11: Consider factors relating to scrolling and paging. Nielsen [2010] states that users spend 80% of their time looking at content above the page fold. Dykes [2012] also highlights the importance of prioritizing content to ensure that crucial content appear above the fold. Spool et al. [1999] have a different opinion about the placement of content above the fold, pointing out that the placement of horizontal content separators often creates the illusion that the content below the separator is of low importance, especially when the separator falls close to the fold. Spool et al. [1999] also emphasize the need to avoid button gravity, which occurs when users are attracted to the last button in a form although there may be several other buttons above it. Leavitt and Shneiderman [2006] suggest avoiding horizontal scrolling on a web page.

Guideline #12: Use clear headings, titles, and labels. Leavitt and Shneiderman [2006] state that users often scan websites rather than reading them. The following suggestions have been made to facilitate scanning: (1) clearly categorize all labels; (2) provide descriptive page titles that reflect the content displayed on the browser; (3) highlight critical data; and (4) use descriptive row and column headings rather than shortened forms.

Guideline #13. Focus on text appearance. Leavitt and Shneiderman [2006] stress the importance of the appearance of text on web pages and identify the following basic but crucial elements with regard to design: (1) use a font size of at least 12 points; (2) use familiar fonts; (3) provide a good contrast between text and background color; (4) use a consistent format for common items such as dates and telephone numbers; (5) maintain visual constancy within the page (size and spacing, color, fonts, etc.); and (6) use bold font only when required. Nielsen [2012] notes that many user screens are being changed to higher resolution and high definition; therefore, designers must accommodate appropriate font styles. Although the traditional sans-serif font is still applicable, Nielsen [2012] suggests that Verdana be discontinued and that Calibri be used instead for better use of space.
• **Guideline #14.** Consider key factors in web content design. Webb [2012] and Princeton University [2008] highlight the importance of content design for websites. Leavitt and Shneiderman [2006] state that content is the most important part of web design, and provide the following guidelines in this regard: (1) arrange content in a time-based sequence; (2) use simple language that can be easily understood by the user and avoid jargon; (3) induce familiarity in content vocabulary; (4) limit the use of abbreviations and, for those abbreviations that are used, specify the abbreviation meanings; (5) use capitalization conventionally; (6) summarize content; (7) organize information clearly; and (8) ensure that all required information is displayed and that related content is grouped. According to Petros et al. [1990, cited by Isakson and Spyridakis, 1999], the difficulty of the text affects the reader’s ability to comprehend meaning because more complex text requires more brain-processing power. Isakson and Spyridakis [1999] state that content writers should use techniques to increase the user’s familiarity with the context so as to facilitate better understanding. Spyridakis [1989] stresses the importance of using headings that contribute to the underlying content and, in turn, signal superordinate content to the user.

3.1.4. **Critical Evaluation of Usability Guidelines**

From the preceding discussion, it is evident that usability can be explored from various dimensions, each of which contributes to better support of various types of users. Shneiderman’s design principles [cited by Kotzé, 2009] are more generic to interface design, whereas those proposed by Leavitt and Shneiderman [2006] are more specific to web interface design and can thus be considered an extensive elaboration of the Shneiderman principles, which relate the findings to the barriers of the web. Although both sets of guidelines focus on the importance of consistency, support for expert users, feedback, robustness, and support recognition rather than recall, the principles proposed by Leavitt and Shneiderman [2006] relate specifically to the design of the interface involving web technologies. Mifsud [2012] states that the principles proposed by Leavitt and Shneiderman [2006] are similar to those discussed by Nielsen and Tahir [2001] in that both provide a complete set of guidelines for web application design.

Yatsenko et al. [2002] point out that, although there are similarities between traditional usability guidelines and some web-based usability guidelines, only 20% of the traditional guidelines are web-relevant. Researchers state that, because of
the wide diversity of web developers, many of the web design guidelines focus more on visual effects than on factors such as dialog design and error handling [Ratner et al., 1996; Ohnemus, 1997, cited by Yatsenko et al., 2002; Ohnemus, 1997, cited by Yatsenko et al., 2002; and Ohnemus, 1997]. The majority of the web design guidelines proposed by Leavitt and Shneiderman [2006] is directed more toward the content and appearance of the web interface.

Nielsen [2011] identifies 10 common mistakes that result in poor web design: (1) poor design of search functions, (2) use of PDF files for reading, (3) inability to change the color of visited links, (4) use of non-scannable text, (5) use of fixed font size, (6) appearance of page titles with low search visibility, (7) overuse of advertisements, (8) poor consistency, (9) overuse of pop-ups, and (10) inability to answer user questions. Both sets of principles discussed in the preceding section relate in some way to avoiding these 10 mistakes.

Additional rules such as Google Panda Guidelines [Google Inc., 2011] can be adopted to facilitate search and quality. Riegelsberger and Sasse [2001] present an interesting expansion by building a connection between usability and users’ perceived trust of an e-commerce website. The authors explain that conventional trust-building focuses mainly on the transfer of trust, which may be suitable to attract novice users, but not experienced shoppers for whom the interface plays a crucial role in communicating trustworthiness. This issue of trust is discussed further in the following section.

3.2. Trust

Our review of the literature revealed that there are various behavioral and social factors that also have an influence on whether an online system is perceived as secure. It has been argued that, regardless of how secure a system may be, if users fail to perceive via the website that the merchant is a safe one, the overall success of the transaction may be compromised [Egger and Abrazhevich, 2001]. The authors note that, although security often builds user confidence in using a system, it is not the only factor that contributes to building trust. Salam and Pegels [2003] support this statement, stressing that an e-commerce website providing a secure technological infrastructure alone is insufficient for building consumer trust. They recommend the use of trusted intermediaries as a means of overcoming the barriers imposed.

Bheemarasetty et al. [2010] formulate a link between trust and security and categorize two types of trust models: hard trust and soft trust. They state that hard trust refers to security mechanisms such as encryption, which are designed to gain
an agent’s belief in the identity, benevolence, and competence of another agent. According to Victor et al. [2011], hard trust refers to methods of identity verification and authorization, whereas soft trust is established between two individuals in a network. This type of trust focuses mainly on external observations of a system that are established through social control mechanisms [Bheemarasetty et al., 2010].

Corritore et al. [2003] also identify two categories of trust: swift trust (which occurs when relationships are quickly established and ended) and slow trust (which is built over time and exists in long-term relationships). Trust has also been categorized as cognitive trust and emotional (affective) trust [Lewis and Weigert, 1985, cited by Corritore et al., 2003; McAllister, 1995; Falcone and Castelfranchi, 2001; and Johnson and Grayson [2005]. In the current study, we focus more on affective trust, on the assumption that the merchant has implemented cognitive trust measures such as digital certificates and reputation-based measures.

3.2.1. Affective-Based Trust Mechanisms

It can be argued that an online purchase is not based solely on a person’s immediate understanding and assessment of the product or service being offered online, but is also based on an emotional component that is built and nurtured over time. Affective-based trust is built on the user’s social and emotional bond, which goes beyond a normal business relationship to encompass an emotional relationship that links individuals [McAllister, 1995]. Nielsen [1999] states that the trustworthiness of a website can be reflected through three main areas of interface design (Table 3).

With regard to affective-based trust mechanisms, the following section contains a discussion of perceived trust and indicators of trustworthiness.

Perceived Trust

According to Riegelsberger and Sasse [2001], elements of the user interface can be categorized as either a trust builder or a trust buster, each with distinctive characteristics as defined in Table 4.
Table 3  
Three Main Areas of Interface Design for Trustworthiness  
[Nielsen, 1999]

<table>
<thead>
<tr>
<th>Area</th>
<th>Description</th>
</tr>
</thead>
</table>
| Appropriate use of technology     | ▪ Absence of technical difficulty on website  
▪ Appropriate use of features such as encryption and download speed        |
| Communication of trustworthiness  | ▪ Design quality  
▪ Upfront disclosure of all aspects relating to customer relationship  
▪ Comprehensive, correct, and current content  
Interlink to other websites       |
| Sensitive use of email            | ▪ Disclosure of how the user’s email address will be used, so as to encourage users to provide their email address |

Table 4  
Characteristics of Trust Builders and Trust Busters  
[Riegelsberger and Sasse, 2001]

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Trust builder | ▪ Status indicators  
▪ Displays of previously entered data  
▪ Continuous visibility of products to be ordered  
▪ Order tracking  
▪ Recourse  
▪ Ability for users to have trial runs/experiments  
▪ Assignment of responsibilities  
▪ Virtual re-embedding (transmit social cues) coupled with functionality  
▪ Communicating trustworthiness as a by-product of functions |
| Trust buster   | ▪ Poor usability  
▪ Inconsistent design  
▪ Technological failures  
▪ Long response time  
▪ Non-compliance with business and online standards  
▪ Positioning of terms and conditions, shipping details, etc., so that they may be hidden or not easily visible to users  
▪ Intentional use of personal trust cues without functionality  
▪ Agents creating expectations they cannot live up to |
Images have long been a method of allowing humans to express themselves when words fail. Consider a situation where two parties communicate over a chat application. The two parties rely on the use of “emoticons” to express their feelings in order to overcome the limitations/barriers imposed by the online mode of communication. In the literature, virtual re-embedding is an area of interest. Giddens [1990], for example, states that online transactions are dis-embedded when the concept of social relations is removed from the interaction between the shopper and the vendor. The nature of the dis-embedded relationship increases the need for trust mechanisms.

In another study, Steinbrueck et al. [2002] investigate the use of images of people as a way of building trust between the merchant and the shopper (B2B environment) and between customers (C2C environment). Their study builds on the idea that advertising uses images of people as a way of building trust and building a positive attitude toward the product or service [Riegelsberger et al., 2003]. The results of the study by Steinbrueck et al. [2002] indicate that the use of photographs of a company’s staff contributes positively to customer trust. Zheng et al. [2002] concur, stating that the use of photographs supported by social interaction provides an effective basis for building trust. These findings are contradicted by Riegelsberger and Sasse [2002], who argue that photographs do not have any inherent impact on the trustworthiness of the website. Their research indicates that the use of photographs affects different shoppers in different ways (Table 5).

These categories of shoppers shown in Table 5 can be considered an extension of the user categorization formulated by Smith and Salvendy [2007] and Trulock [2008], which was discussed in a previous section. It should be remembered that the objective of an e-commerce website is not only to attract customers, but also to retain existing customers, encourage repurchase, and increase the confidence of site visitors so that they will make a purchase.
Table 5

How Photographs Affect Shoppers
[Riegelsberger and Sasse, 2002]

<table>
<thead>
<tr>
<th>Type of Shopper</th>
<th>Effects of Photographs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship seeking</td>
<td>• Photographs do not elicit their trust, but allow them to intensify their relationship to a brand.</td>
</tr>
<tr>
<td></td>
<td>• They disapprove of images that they feel are inappropriate to the brand.</td>
</tr>
<tr>
<td></td>
<td>• Expressive/interaction media such as chat rooms promise to increase their loyalty.</td>
</tr>
<tr>
<td>Function seeking</td>
<td>• They prefer an anonymous, lean service.</td>
</tr>
<tr>
<td></td>
<td>• Photographs are mostly rejected.</td>
</tr>
<tr>
<td></td>
<td>• Task effectiveness and efficiency are more important.</td>
</tr>
<tr>
<td>Lacking benefits</td>
<td>• Their main goal is not to shop online because the cost does justify the benefits.</td>
</tr>
<tr>
<td></td>
<td>• They react positively to the use of images.</td>
</tr>
<tr>
<td></td>
<td>• Use of synchronous media such as chat rooms can further encourage these users to make a purchase.</td>
</tr>
<tr>
<td>Lacking trust</td>
<td>• They have a low propensity to trust online vendors.</td>
</tr>
<tr>
<td></td>
<td>• Photographs have a negative impact where the user assumes that it is an attempt to manipulate their trust, which results in more distrust on their part.</td>
</tr>
</tbody>
</table>

In their study, Riegelsberger et al. [2003] conclude that the use of images does not guarantee user trust and that, although photographs may result in trust, they do not have an impact on trust. They found that the use of a photograph on only one page of the website appears to have an effect on the user’s reaction to the website, implying that the effect is dependent on photo-site interaction. In his investigation of the emotional evaluation of multiple home pages using the self-assessment manikin (SAM), Dormann [2001] found that the use of images and color has a significant impact on the user’s level of arousal and pleasure. It can be argued, however, that the impact is a very context-oriented result. Based on the product or service offered by the website, the result can be either successful or unsuccessful.
Indicators of Trustworthiness

Che Hussin et al. [2003] indicate that the use of trust attributes on a website can contribute positively to assuring users that their personal information is secure. Their ranking reveals that the company contact information appears to be of high importance. Interestingly, indirect methods of contact such as telephone and email appear to have higher leverage compared with the physical address of the store. The difference may be due to convenience. Surprisingly, the privacy policy of the company and third-party verifications appear to be of less importance compared with contact information and methods of contact. They found that photographs of company staff have little impact on the user’s level of trust, which supports the findings of Riegelsberger et al. [2003].

Shafie et al. [2011] look at a sample of female entrepreneurs on an e-commerce platform called Blogshop and identify a similar list of trust attributes. Their list in some ways confirms the list of attributes discussed by Che Hussin et al. [2003], but a major limitation of their research is the lack of discussion on how effective the attributes are in building trust between the merchant and the consumer.

A survey by Holst [2013] explores how users perceive security seals on websites. The findings are presented in Figure 1.

Figure 1. User’s Perception of Security Seals [Holst, 2013]
It is clear from the results shown in Figure 1 that Norton carries high perceived security among users, compared with its competitors. It can be argued that users are more influenced by what they perceive to be secure than by the actual security itself. This is evident by the fact that, when compared with SSL seals (Norton, Thawte, Trustwave, GeoTrust, and Comodo), trust seals (McAfee SECURE, TRUSTe, and BBB), with the exception of Norton, still carry a significantly high score. According to Holst [2013], this may be due to the fact that SSL seals indicate the actual security involved in the payment process. One of the major weaknesses of using trust seals alone is that, rather than indicating the technical security used on the website, trust seals communicate only a certification by an authority.

Hu et al. [2005] further prove that the use of web seals is effective in communicating the trustworthiness of a website. Building on this finding, Holst [2013] recommends not only the use of multiple trust seals to communicate the encryption connection proven by an SSL seal, but also the use of trust seals such as McAfee to communicate a “hacker free website,” and BBC or TRUSTe to communicate “trust in consumer relations.”

Neacsu (2010) recommends that trust seals be used wisely and suggests that designers to be careful in differentiating site-wide and page-sensitive seals. He states that the recommended placement of seals is on the top near the logo and at the checkout process. Roggio [2010] looks at several good examples of trust seal placement and identifies the following as suitable positions:

▪ Upper right corner of every page below the main menu
▪ Upper right corner below the welcome message of every page
▪ Bottom of the screen (footer) of every page
▪ Checkout screen below the form

A study published by VeriSign [Voodoo Inc., 2013] provides further insight into effective placement of trust seals. The study reveals that, instead of placing the trust seal at the top or at the bottom of the checkout page, placing it next to the crucial fields in the checkout form results in an increase of up to 65% in conversion rate.
With regard to the usability research discussed earlier, it was found that important information that is intended to catch the user’s attention should be placed above the page fold.

Social influence also plays an important role in the user’s perceived trustworthiness of an online merchant. Huang et al. [(2012] discuss the infusion of social influence through the introduction of social features such as information sharing and through the use of social media such as Facebook or Twitter. Their finding is supported by Johnson [2013] and by Rowan and Cheshire [2011], who discuss the various uses of social media to build social influence (Table 6).

<table>
<thead>
<tr>
<th>Use</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create social media</td>
<td>Use of popular social platforms such as Facebook or Twitter is suggested.</td>
</tr>
<tr>
<td>presence</td>
<td></td>
</tr>
<tr>
<td>Include sharing options</td>
<td>Provide sharing buttons on the website to allow customers to share their opinions and reviews on social media.</td>
</tr>
<tr>
<td>Add product videos</td>
<td>Further enabling customers to share videos will allow the company to add viral marketing to its website.</td>
</tr>
<tr>
<td>Engage customers</td>
<td>Social media can be used to attract visitors to the website, and having communities on the website will allow users to interact and engage within the website.</td>
</tr>
<tr>
<td>Reciprocate</td>
<td>Reciprocation can be used to build trust.</td>
</tr>
</tbody>
</table>

Bavelas [1948, cited by Freeman, 1979] and Shaw [1954, cited by Freeman, 1979] state:

“When a person is placed strategically along the communication paths linking pairs of others, that person is central. A person in such a position can influence the group by withholding or distorting information in transmission.”
In this context, Freeman [1979] states that centrality is related to how
groups make decisions or solve problems. In the context of making
purchases online, this argument implies that identification of the central
node in a communication path helps the business to identify a core
influencer of decision-making. Kim and Srivastava [2007] look at
technologies available to support the decision-making process involved in
e-commerce transactions through the use of social influence [Table 7].

Table 7
Technologies Supporting Social Influence in E-Commerce Transactions
[Freeman, 1979; Kim and Srivastava, 2007; Brin and Page, 1998;
Kleinberg, 1999; Hoff et al., 2002]

<table>
<thead>
<tr>
<th>Factor</th>
<th>Technology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify key node</td>
<td>Degree</td>
<td>Identifies the popularity/activeness of a node</td>
</tr>
<tr>
<td></td>
<td>Betweenness</td>
<td>Identifies the frequency of the node appearing in the shortest path between</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the communication of two other nodes</td>
</tr>
<tr>
<td></td>
<td>Closeness</td>
<td>Is a relative indicator of the closeness that a central node has to all</td>
</tr>
<tr>
<td></td>
<td></td>
<td>other nodes in the communication channel</td>
</tr>
<tr>
<td>Page rank</td>
<td></td>
<td>Measures the importance of web pages</td>
</tr>
<tr>
<td>Hits</td>
<td></td>
<td>Looks at forming a link between authority pages and hub pages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analyzes links within a broad search topic to identify the relevance and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>quality of the search results</td>
</tr>
<tr>
<td>Extract community</td>
<td>Calculation of link</td>
<td>Uses the link weights to calculate the strength of the social relationship</td>
</tr>
<tr>
<td></td>
<td>weights</td>
<td>existing within the group</td>
</tr>
<tr>
<td>Predict links and trust</td>
<td>Latent space model</td>
<td>Looks at predicting the social link between actors in a network</td>
</tr>
<tr>
<td>values</td>
<td>Dynamic latent space</td>
<td></td>
</tr>
<tr>
<td></td>
<td>model</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eigen value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>propagation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Probabilistic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>relationship models</td>
<td></td>
</tr>
</tbody>
</table>
5. ANALYSIS AND RESULTS

Based on our extensive research of the literature, we formulated a solution architecture, using the usability principles proposed by Leavitt and Shneiderman [2006]. To test and validate how users perceive trust via these usability and trust mechanisms, we developed an artifact in the form of a set of sample web pages that were created to depict an online merchant. One set encompassed the properties proposed by Leavitt and Shneiderman [2006], and the other set was designed to intentionally violate these heuristics in order to determine whether the incorporation of the heuristics has an impact on the user experience and intention to use. The sample interfaces of the home page for the two simulated websites are shown in Figure 2 and Figure 3.

![Figure 2. Web Interface Adhering to Recommended Usability and Trust Principles (Set 01)]
In designing the simulated website Set 01, we took into consideration 39 measures identified during our research of the literature. These are presented in Table 8. For Set 02, we intentionally violated those principles to determine whether this would have a negative impact on the user’s intention to use the application.

Table 8
Measures Taken into Consideration in Design of Set 01

<table>
<thead>
<tr>
<th>No.</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The task bar will display the name of the page that the user is currently on. The page name will act as an indicator of the user’s location within the website. This measure supports the principles identified by Miller [1956] by reducing the load on the user’s short-term memory.</td>
</tr>
<tr>
<td>2</td>
<td>The size of the graphics was reduced to display important content over the page fold [Leavitt and Shneiderman, 2006; Nielsen, 2010].</td>
</tr>
<tr>
<td>No.</td>
<td>Measure</td>
</tr>
<tr>
<td>-----</td>
<td>---------</td>
</tr>
<tr>
<td>3</td>
<td>The contents were organized in alphabetical order in the hot links section and were formatted to indicate that it is a clickable area on the screen [Leavitt and Shneiderman, 2006; Kalbach, 2007; Shelly et al., 2009].</td>
</tr>
<tr>
<td>4</td>
<td>Trust logos were placed on the upper right corner of the page [Roggio, 2010].</td>
</tr>
<tr>
<td>5</td>
<td>The user’s name is displayed to indicate the user status [Nielsen, 2001]. An option was given to log out as the user, if necessary, and was formatted to indicate that it is a clickable link.</td>
</tr>
<tr>
<td>6</td>
<td>The shopping cart was displayed in the upper right corner to provide visibility. A metaphor was used for usability purposes, along with an indicator of the number of items currently in the shopping cart.</td>
</tr>
<tr>
<td>7</td>
<td>An indicator of the brands supported by the website was posted below the trust symbols in an effort to build confidence in the website [Fogg, 2002].</td>
</tr>
<tr>
<td>8</td>
<td>FAQ was provided to increase the credibility of the website [Fogg, 2002] and to support novice and intermittent users [Smith and Salvendy, 2007; Trulock, 2008; Parush and Parush, 2004].</td>
</tr>
<tr>
<td>9</td>
<td>The “Contact Us” and “About Us” pages were used as methods of providing credibility [Fogg, 2002].</td>
</tr>
<tr>
<td>10</td>
<td>Images of people were added to this interface with the intention of testing whether photographs have an impact on the level of trust [Riegelsberger and Sasse, 2002].</td>
</tr>
<tr>
<td>11</td>
<td>Mandatory fields were highlighted using an asterisk, whereas optional fields were marked as “(optional)”.</td>
</tr>
<tr>
<td>12</td>
<td>To ensure security, constraints were enforced in the creation of passwords. To support the user and enforce robustness [Nielsen, 1993], instructions were given regarding the properties that should be included in a good password.</td>
</tr>
<tr>
<td>13</td>
<td>Trust seals and SSL seals were put on the registration page to indicate that the information entered into the form would be secure.</td>
</tr>
<tr>
<td>14</td>
<td>The user was given the ability to read the terms and conditions relating to the website by clicking on a hyperlink. Consistency was maintained in indicating clickable areas on the screen.</td>
</tr>
<tr>
<td>15</td>
<td>The menu option selected was highlighted as a method of providing visibility of system status [Nielsen, 1993].</td>
</tr>
<tr>
<td>16</td>
<td>The items under the menu options were colored blue to indicate that they act as hyperlinks, and the color of selected items was changed to a standard purple to indicate that they have been clicked.</td>
</tr>
<tr>
<td>17</td>
<td>Ratings were given to support the user’s decision-making process [Equity Marketing Solutions, LLC, 2013]. Shimada [2011] states that this is social proof that the product is accepted or not accepted by other users. This device can be used to build user’s confidence in the product.</td>
</tr>
<tr>
<td>18</td>
<td>Items on sale were indicated to encourage bargain hunters [Kidsontalks, 2007].</td>
</tr>
<tr>
<td>No.</td>
<td>Measure</td>
</tr>
<tr>
<td>-----</td>
<td>---------</td>
</tr>
<tr>
<td>19</td>
<td>A slide-able price adjuster was given to allow the user to set the price ranges of the items he or she wishes to view, thus enabling the user to customize the user interfaces [Dix et al., 2004].</td>
</tr>
<tr>
<td>20</td>
<td>Product recommendations were given based on the details given by the user in the profile (will be discussed later) [Abbattista et al., 2002].</td>
</tr>
<tr>
<td>21</td>
<td>Details such as community, delivery and shipping, security, policies related to the company, any questions, and the site map were included at the bottom of the screen.</td>
</tr>
<tr>
<td>22</td>
<td>The last date that the site was updated was indicated at the bottom to build credibility.</td>
</tr>
<tr>
<td>23</td>
<td>The price and rating given on the previous page were displayed to support memorability [Miller, 1956; Equity Marketing Solutions, LLC, 2013].</td>
</tr>
<tr>
<td>24</td>
<td>Referrals to credible sources were created to improve trust and confidence [Fogg, 2002; Martin, 2014].</td>
</tr>
<tr>
<td>25</td>
<td>Customer reviews of products were provided and users were given the ability to comment and provide feedback as a method of improving website credibility [Stanford Persuasive Technology Lab, 2004].</td>
</tr>
<tr>
<td>26</td>
<td>The Facebook “Like” button was included to allow for comments in order to build reliability of comments and to introduce social influence [Johnson, 2013].</td>
</tr>
<tr>
<td>27</td>
<td>When the “Add to Cart” button is clicked, the number of items in the shopping cart is updated and indicated, in order to support memorability [Miller, 1956; Nielsen, 1995].</td>
</tr>
<tr>
<td>28</td>
<td>Immediate indication of the item added with control options is displayed for the user [Leavitt and Shneiderman, 2006].</td>
</tr>
<tr>
<td>29</td>
<td>The color of the button changes to indicate that it is clicked, thus providing visibility of system status.</td>
</tr>
<tr>
<td>30</td>
<td>An indicator was created to reflect the progress of the process, in order to adhere to the principle of reflecting system status [Dix et al., 2004].</td>
</tr>
<tr>
<td>31</td>
<td>An authentication of the user was done before the user proceeded to payment in order to enforce security.</td>
</tr>
<tr>
<td>32</td>
<td>The last used delivery and billing address was displayed for ease of use, and the user was given control to change it if necessary.</td>
</tr>
<tr>
<td>33</td>
<td>Payment options were displayed to the user with the intention of providing flexibility [Dix et al., 2004] and trust.</td>
</tr>
<tr>
<td>34</td>
<td>Trust seals were provided to encourage users to continue with the payment process [Dix et al., 2004].</td>
</tr>
<tr>
<td>35</td>
<td>The payment options were displayed for clarity [Dix et al., 2004].</td>
</tr>
<tr>
<td>36</td>
<td>Mandatory options were marked with an asterisk, consistent with previous forms.</td>
</tr>
</tbody>
</table>
5.1. Artifact Testing

To test whether adherence to the usability and trust principles in Table 8 truly has an impact on building the online buyer’s trust of the online merchant, we conducted two experiments.

The first experiment was designed to evaluate the two sets of interfaces – Set 01, which provides usability, and Set 02, which violates usability principles resulting in poor usability. This experiment was carried out using the heuristic evaluation checklist proposed by Pierotti [1993].

The second experiment was in the form of a discussion where 10 users were asked to provide their opinions of the two sets of interfaces (Set 01 and Set 02). It should be noted that the constructs identified as “influencers” of adoption were proved in our previous research using a sample of 408 respondents [Peiris and Kulkarni, 2015]. Therefore, the instrument used in the current study to assess the two sets of web interfaces was classified based on the variables perceived usefulness (PU), perceived ease of use (PEU), perceived security risk (PSR), willingness to disclose personal information (WDPI), social influence (SI), and trust.

For the purpose of evaluation, we chose the 10 heuristics proposed by Nielsen and Molich [1995] over other valuation methods, such as action analysis [Holziner, 2005], cognitive walk-through [Tonkin, 2005], and heuristics proposed by Tognazzini [n.d.]. Cognitive walk-through and action analysis are both task-oriented. It can be argued that the two are impractical, considering the fact that the testers may overlook a certain flow of tasks that the user may follow when using an interface. In the case under consideration, we carried out the interface evaluation, based on a specific task that the user would be doing when using the interface.

The heuristic evaluation (experiment 1) was conducted by three participants who used the checklist proposed by Pierotti [1993]. Because the method requires that the evaluation to be done by participants with some domain knowledge in

<table>
<thead>
<tr>
<th>No.</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Trust seals and SSL seals were placed to provide confidence in the security of the transaction.</td>
</tr>
<tr>
<td>38</td>
<td>Informative feedback was given on the product delivery details. In addition, a link was provided to enable customers to contact the company if necessary [Dix et al., 2004].</td>
</tr>
<tr>
<td>39</td>
<td>All purchase details were displayed to support memorability [Miller, 1956].</td>
</tr>
</tbody>
</table>

*International Journal of Business and Information*
usability, the investigation involved two user interface designers and a software engineer. The testers evaluated the two user interfaces against the checklist proposed by Pierotti [1993]. The results of their evaluation were favorable. The findings revealed that, as predicted, Set 01 adhered to the heuristics proposed by Nielsen and Molich [1995], whereas Set 02 violated many usability principles, which resulted in poor usability. The results enabled us to move forward to the focus group discussion (experiment 2).

The focus group discussion involved 10 participants. The interfaces designed for Set 01 and Set 02 were projected and reviewed, based on user scenarios designed to cater to each category of user identified previously in Table 2. At the end of each scenario, the participants were given the opportunity to ask questions, and the researcher provided feedback and clarified doubts. After viewing each set, the 10 participants were asked to complete a checklist indicating how the interfaces influenced their perceived usefulness, perceived ease of use, perceived security risk, perceived willingness to disclose information, perceived social influence, and perceived trust.

6. FINDINGS AND DISCUSSION

The results of our experiments confirm the hypothesis that incorporating the recommended heuristics helps to improve the user’s emotions in terms of the variables considered. The average rating was calculated based on the feedback given by the participants. The results for Set 01 and Set 02 are shown in Figure 4.

![Figure 4. Results of the Analysis of Set 01 and Set 02](image-url)
Figure 4 clearly indicates that there is a significant difference in the impact that the two interfaces have with regard to the variables identified. The feedback from participants provide more insight into why the discrepancy occurred. The results indicate that use of the identified heuristics has a positive impact on the overall acceptance of a website, whereas violating the heuristics can negatively impact the user’s confidence in using the web-based e-commerce portal. The overall findings are depicted in Figure 5.

![Proposed Framework Based on Results of Study](image)

**Figure 5. Proposed Framework Based on Results of Study**

The results of this study validate the hypothesis that the intention to use an e-commerce website is influenced by the usability and the effective trust conveyed via the web interface. A significant finding is that trust itself is indicated by the usability and credibility of the website. It can be concluded, therefore, that website
designers must take into account the implications of usability and trust on the adoption of the website.

7. FURTHER RESEARCH

Although usability principles have been proposed, our research of the literature reveals that attention has not been given to investigating how these individual principles can influence a consumer’s purchasing decision. Knowing how these principles impact the decision-making process can be valuable for system designers. As implied by Riegelsberger and Sasse [2001], the impact of the use of images on e-commerce websites is yet to be explored in terms of how such images influence consumer purchasing behavior.

The current research used a sample of 10 participants to conduct an experiment involving two sets of interfaces for a simulated website. Such a small sample limits the amount of feedback received with regard to perceptions. We recommend, therefore, that the proposed model in Figure 5 be validated using a larger sample size and various demographics. The current study opens a path for future research that may provide further insight into how online merchants can effectively project their trustworthiness to consumers.

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Implications of Trust and Usability on E-Commerce Adoption

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ABOUT THE AUTHORS

Manesha Peiris is a senior lecturer in the Asia Pacific Institute of Information Technology (APIIT), Sri Lanka. She received her B.Sc. and M.Sc. degrees in the area of Information Systems from Staffordshire University, UK. Her research interests include technology adoption, human computer interaction and analytic hierarchy process (AHP). She has published her work in many international conferences and journals, such as ISAHP and Procedia Engineering.

Dhananjay Kulkarni is a senior lecturer at the Asia Pacific Institute of Information Technology (APIIT), Sri Lanka. He received both his Ph.D. and M.Sc. degrees in the field of computer science from the University of California, USA. His research interests include data streams, password security, real-time event processing, cyber security, and information privacy. He has published his work in several journals and also submitted research papers at the international level for organizations such as ACM and IEEE. He also serves as a member of the Programme Committee and Review Board of International Conferences and Journals in the field of computing.