

Assessment of Persuasive Design Principles in E-Commerce Applications Based on Users' Reviews

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Abstract: *Different e-commerce applications aim to utilize different techniques and methods to enhance their usability and persuasive design experience. Persuasive design persuades users to use an application. Users also review the applications they use and provide comments based on their experiences. Therefore, this study aims to examine that to what extent the principles of the persuasive systems design (PSD) model have been implemented in a number of e-commerce applications in Saudi Arabia based on user reviews. Users' reviews have been extracted using Appbot tool. Filtering and categorizing the collected users' reviews took place before analyzing the data. The filtering and categorization were based on PSD model. The results demonstrate which principles of the PSD model are highly used in the selected applications based on users' reviews. Tailoring, tunneling, and reductions principles have been reported to be positively utilized and implemented by the selected applications. Moreover, the findings report different users' reviews on rewards and social supports principles.*

Keywords: *Persuasive Systems Design (Psd) Model; Human Computer Interaction, Usability; E-Commerce, Users Review, Persuasive Design, Usability.*

I. INTRODUCTION

Nowadays, e-commerce applications are expected to utilize persuasive design due to its impact on users' satisfaction. Persuasive design is a technique used to focus on influencing users' behavior through service and product characteristics in order to persuade them to take a specific action toward a certain goal. Hence, persuasive design in e-commerce plays a significant role in increasing revenue, maintaining customer loyalty, and increasing user satisfaction. Moreover, users are usually concerned about their security, privacy, and trust while shopping online; therefore, persuasive design principles should be adopted in consideration of these factors [1]. Users are also expected to leave a website within five seconds once they feel they may not be able to find what they are looking for [2]. Their decision to resume browsing sometimes depends on their trust [3]. Although website usability affects e-commerce revenues, persuasive design in e-commerce applications is considered a vital reason for the success of e-commerce and can affect e-commerce revenue. Therefore, it is necessary to estimate the impact of designing, implementing, and adopting persuasive design model principles in e-commerce websites [4]. Such achievement can contribute into converting users from browsers to shoppers

[5]. Persuasive design in e-commerce from the users' perspective should be further examined and investigated. Therefore, this study aims to assess the adoption of persuasive design principles in a number of e-commerce applications in Saudi Arabia from users' reviews. It utilizes the Appbot application to extract users' reviews in three commonly used e-commerce applications in Saudi Arabia. Data is analyzed and discussed, followed by findings and recommendations.

II. RELATED WORK

Persuasive design aims to convince users to stay longer on a website, spend money, and visit it again. It is a design practice that mainly concentrates on influencing users' behavior and persuading them to take certain actions toward certain goals [6]. The implementation of a persuasive design depends on what a website offers, and there are five core principles to create a persuasive design on e-commerce websites: clear information about the owner of the website and what they provide, visual appeal via a typical design that meets customers' expectations, the use of visual hierarchy to persuade customers to take specific actions, keeping customers' attention, and each page on the website having a singular focus [5]. In addition, there are different models to help designers implement or assess persuasive design. The Fogg behavior model (FBM) is one of these models. This model aims to understand users' behavior depending on three factors: triggers, ability, and motivation. The target behavior happens when all of these factors occur at the same time and the users have sufficient motivation and effective triggers and abilities [7]. Another model is the eight-step design process. This model helps create a pattern to follow in designing persuasive content, which is done by following eight steps, mostly in sequence. These steps serve as milestones in order to achieve a more effective design process. The first step is to choose a simple behavior to target. In this step, the designers need to decide on a suitable behavior to target for change, which should be the smallest, simplest behavior. Second, choose a receptive audience: select the right audiences that are common with the technology channel, which leads them to be more responsive to change. Third, find out what is preventing the audience from performing the target behavior. Fourth, choose a common technology channel.

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The designer identifies which channel is best depending on three factors, which are the first three steps in the design process: the target behavior, the audience, and what is preventing the audience from adopting the target behavior. The first four steps in the persuasive technology design process are usually performed in this sequence, but the designer may make an exception in some cases and follow the steps in a different order. Fifth, find suitable examples of persuasive technologies that are relevant to the intervention. Sixth, imitate successful examples: rather than going back to square one, a more appropriate and desirable approach is to imitate successful examples. Seventh, test and iterate quickly: after a designer imitates successful examples, test various persuasive experiences quickly and repeatedly. These experiments allow the designer to model the experience and observe how people react by measuring behavior. Finally, expand on success: establishing a persuasive technology that changes behavior is a milestone [8]. The persuasive systems design (PSD) model is a comprehensive model for designing and evaluating a persuasive system. This framework comprises 28 persuasive principles that guide the designer to build a persuasive system as shown in Table 1. These principles are categorized into four groups, which are primary task support, dialogue support, credibility support, and social support. The PSD model consists of three main phases. First, the designer should understand postulates before the analysis and development of the persuasion context. Then, the persuasion context is analyzed. After that, designers check to see if the system achieves a particular set of persuasive system principles [4].

Table 1. Persuasion principles[4].

Primary task support	
Principle	Example requirement
Reduction	Reduce complex tasks into simpler tasks to help users perform the target behavior.
Tunneling	Guide users in the attitude change process by moving them nearer to the target behavior.
Tailoring	Tailor information based on users' potential interests and usage patterns.
Personalization	Make more personalized services and content available in a system for persuasion.
Self-monitoring	Allow users to track their behavior.
Simulation	Enable users to see the relationship between cause and effect.
Rehearsal	Ability to change people's behavior.
Dialogue Support	
Principle	Example requirement
Praise	Use images to provide positive feedback.
Rewards	Systems that provide rewards to their users.
Reminders	Reminding users to carry on the tasks.
Suggestion	Systems that provide suggestions to help users to achieve their target behaviors.
Similarity	Behaving similar to users behaviours.
Liking	Systems that are more attractive for

	their users and are therefore more persuasive.
Social role	Systems that adopt a social role, making users more likely to use it for persuasive purposes.
System credibility support	
Principle	Example requirement
Trustworthiness	Application that is viewed as fair.
Expertise	Application that is viewed as incorporating experience, knowledge, competence.
Surface credibility	Website and application whose credibility is evaluated based on firsthand inspection.
Real-world feel	Application that highlights an organization and the people behind its services or content.
Authority	Application that leverages roles of authority to improve powers of persuasion.
Third-party endorsements	Reliable third-party endorsements boosts perceptions of system credibility.
Verifiability	Credibility is improved if a system makes it easy to verify the accuracy of content.
Social support	
Principle	Example requirement
Social learning	Users' can learn from each other's.
Social comparison	application allow users to compare their performance with the performance of others.
Normative influence	Application leverage peer pressure in order to increase the likelihood.
Social facilitation	Users discern by the system that others are performing the behavior along with them.
Cooperation	Motivating users to adopt a target attitude by driving them to co-operate.
Competition	Motivating users to adopt a target behavior.
Recognition	Application offering recognition where users will adopt a target behavior .

[8] evaluated the persuasiveness of ten e-commerce websites by using principles of the PSD model. They stated the importance of applying the credibility support principles in e-commerce because it involves risk to buyers. So, successful e-commerce website designers place high emphasis on building trust and credibility. The reported employed reward principle in e-commerce helps to encourage users to buy online and to be loyal to the online seller. The authors also mentioned reduction, tunneling, tailoring, and self-monitoring principles as the most common principles implemented by the selected websites. They further reported social learning, social comparison, and cooperation as very important to perform the target behavior by improving user motivation.



They found that there is a need for effective interaction between users and sellers and that a lack of interaction may lead users to being reluctant to complete a financial transaction. Furthermore, the limited utilization of social support principles with ten e-commerce websites is seen as a recommendation for improvement.

[9] evaluated the persuasiveness of two e-commerce websites, Amazon and Jumia, by examining the application of the persuasive design principles of the PSD model. They reported that the implementation of reduction principles helped users to purchase products with less effort. They also mentioned that the implementation of the social roles principle by a social community or chatbot helps users to make informed decisions on what to buy and how to buy products online. Another study was conducted recently by [10] that examined the impact of PSD principles on customer acceptance of smartphone apps in different countries such as the Kingdom of Saudi Arabia, Germany, Malaysia, and the Netherlands. The study findings reported that designers should utilize PSD effectively in order to target global users. They also reported the statistical relationship between a number of PSD principles and users' acceptance. Despite the few studies that have highlighted this area of research, it can be also seen clearly that the above-mentioned studies did not discuss the persuasive design principle implementation from users' points of view. This area can be further explored due to its vital role in e-commerce.

III. RESEARCH DESIGN

This study selected three common e-commerce applications in Saudi Arabia in order to examine how persuasive design principles have been implemented from users' points of view. Usually, users express their feelings, impressions, and comments through negative or positive feedback using the application user review section. This study utilized the Appbot application to extract users' reviews and analyze them in order to examine the implementation of persuasive design principles in the selected application. The following sections discuss the research steps in detail.

A. Persuasive Design Principles

In this study, the users' reviews were analyzed based on 28 persuasion principles that were developed from the PSD model. This model has been defined [4], and the 28 persuasion principles were explained in Table 1.

B. Selected Applications

There are many e-commerce applications that exist in app stores, such as iTunes for iPhone users and Google Play for Android users. Therefore, SimilarWeb was used to selected three e-commerce applications that help to provide the top mobile applications used based in users' selections, such as store type (Apple store, Play), country, and type of application (shopping) (Follow the Leaders: Highest Ranking Apps in Apple App Store, Saudi). The selected applications should contain functional features. The selected applications were SHEIN [11],[12] and [13].

C. Assessment Procedure

Appbot was used to extract users' reviews from selected applications; Appbot is web-based tool that has been utilized in similar research [14][15]. Reviews containing both negative and positive feedback were extracted in an Excel

sheet from Google Play and the App store. All the extracted reviews were taken from the latest versions of the selected applications in order to achieve reliability in the assessment of the persuasive design. Reviews were filtered, and duplicate reviews were removed. Then, all extracted reviews were analyzed manually and categorized based on the PSD model principles in order to identify which principles were used most often.

IV. DATA ANALYSIS

This section aims to analyze user reviews of the selected applications. It begins by presenting the users' reviews of SHEIN, then NOON and ASOS. After that, the most common category of the persuasive design principles represented in the selected applications will be discussed.

A. User Reviews of SHEIN

Each category will be discussed, and critical principles will be also explained, with a number of examples of users' reviews.

4.1.1 Primary Task Support :

There are several positive user reviews found related to the app's organization, product display methods, and provided services in a simplified manner, which all indicate the tunneling principle. The tailoring principle has been represented in users' reviews by offering different payment methods to users. The tailoring principle was reported as a negative aspect due to the inability of the application to switch from language to language, as it requires first changing the language of the user's device to change the language of the application. In addition to the language issues, currency and translation have been also reported as negative aspects of the application.

4.1.2 Dialogue Support :

The rewards principle has been implemented in the application through offering discount codes and rewarding users after each payment they make. However, there were some user reviews of the application commenting on task procedure and its duration. Fig 1 shows examples of users' reviews on the reward principle. This can confirm the importance of looking at users' reviews, although the application implemented this principle.

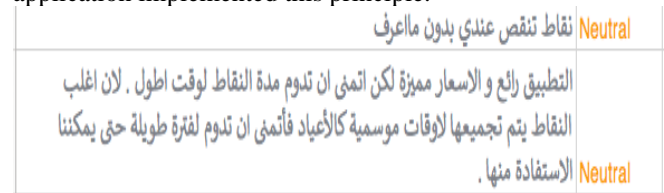


Fig 1. Examples of users' views on the reward principle.

The liking principle has been implemented in the application through good-quality product pictures and their appropriateness. Poor implementation of product pictures may result in abandonment of the application [16]. However, users reported their dissatisfaction toward the late delivery and return policy. Although SHEIN attempts to support the dialogue category though offering online chat, users were still unsatisfied with this principle. This can reveal how users perceive the liking principle in the dialogue support category.

The majority of the users' reviews concentrated on rewards, liking, and social role principles, with few comments on praise, reminders, suggestions, and similarity. This can also uncover the importance and the priorities of dialogue support principles.

4.1.3 Credibility Support :

The application has implemented the trustworthiness principle by offering useful product information and quality. Users commented on this negatively through different views such as quality and the provided information. This can be justified, as recent research reported that system credibility support was reported to have only low levels of implementation as a persuasive systems design principle in mobile applications [17].

4.1.4 Social Support:

Users' reviews considered only the normative influence principle in this category, and they expressed their strong dissatisfaction when products were out of stock. Users did not offer detailed reviews in this category; they commented using different platforms, or this category was not considered as important as others. However, the current study reports that social support does not correlate statistically with users' acceptance, although PSD is related statistically to users' acceptance [10]. This may reveal the possible low impact of the social support category on users' behavior.

B. User Reviews of NOON

This section discusses how different categories were reviewed by users of the NOON application. It reveals how these categories were implemented and how users perceive them.

1) Primary Task Support :

The reduction principle was implemented to reduce any extra unnecessary tasks. Users positively commented on this principle as the application offered them different payment methods, such as Apple Pay. Figure 2 is an example of such comments and satisfaction. Implementing the reduction principle can be seen as a contributing factor in order to increase sales and user satisfaction.

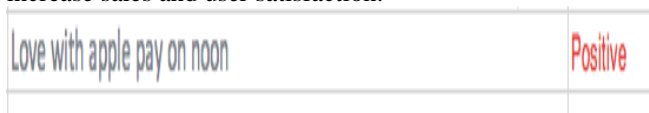


Fig 2. Examples of users' views on the reward principle.

The tailoring principle has been implemented in the application and has been reported on positively: users' reviews confirmed this, although a number of users expressed their desire to improve it more and offer more tailoring features, such as order cancelation. Users did not offer detailed comments and feedback on personalization, self-monitoring, rehearsal, or simulation. This again may refer to how users perceive principles' priorities in the primary task support category.

2) Dialogue Support :

Although the application offers discounts on products and gifts for users after each payment, many users reported their inability to know how to use the reward codes. Users also commented on the return policy and the quality of the pictures in the application. However, this seemingly did not affect their decision, as fast delivery has received clear positive reviews in the applications. Interestingly social role principles received very different user reviews. This can be justified as different users' experiences and the importance of this principle.

3) Credibility Support :

The trustworthiness principle can be seen as the most important principle in the credibility support category due to the large number of users' reviews. The majority of the comments is connected to credit card payments and their inability to proceed quickly. This issue is not limited to a certain application as more security and privacy issues are considered while payments process. Prioritizing security and privacy constraints on usability features is usually recommended when the tasks target financial transactions.

4) Social Support :

Similar to SHEIN, users only commented on the normative influence principle. In addition, users reported their desire to evaluate sellers, although it is provided at the end of delivery stage. This reveals that users prefer to rate their experiences once they finish the tasks. However, this may require users to spend more time on the tasks when fast and efficient processes are highly recommended. Although the application considers social comparison, competition, and recognition principles, users did not offer detailed comments on these principles.

C. User Reviews of ASOS

Primary task support, dialogue support, credibility, and social supports are discussed in this section. Different users' reviews have been reported on each of these categories' principles. The following sections discuss each category and the reported principles.

1) Primary Task Support :

The tunneling principle was the most reviewed by users. There are several positive user reviews as users gain knowledge and understanding of a number of new products while surfing. Although the application has implemented the tailoring principle, users reported a number of suggestions to be taken into consideration while customers use the application, such as language issues. Interestingly, the results did not report any reviews related to the reduction principle, although other applications did. This may refer to ASOS's ability to implement it successfully. This assumption can be supported by the findings of users expressing their satisfaction and excellent experiences while using the application. However, this could be examined further through more statistical testing and analysis.

2) Dialogue Support :

The results have shown that user reviews focused on the reward principle as they kept inquiring about how to get promotion codes, discounts, and loyal customers privileges. The liking principle has received a number of positive reviews due to the application's ability to provide fast service and delivery in addition to instant responses using the chatbot.

3) Credibility Support :

The results have shown that users seem to trust the application and the information provided. Information verification features may increase users' trust and satisfaction. Providing honest and unbiased information can increase the application's credibility.

4) Social Support :

The results did not report much information in the social support category from users' reviews. It only presented users' positive comments on the application, as the shared information was enough to persuade the users to decide. The results only commented on the need of users to have online support using social networks. Generally, the results show that the trustworthiness principle in the system credibility support category received considerable user reviews in NOON and SHEIN. This can be justified by the importance of trustworthiness, so the applications are expected to provide more accurate information to describe their products in order to gain customer loyalty and trust. This is in line with the findings of [9], who stated that applying the credibility support principles in e-commerce contributes to building trust and credibility in e-commerce. The tailoring principle is also one of the most reviewed principles, with users preferring to customize the applications to their preferences, such as language, cancelation options, and currency. This is in line with [16] report that users prefer to use personalized accounts. Reward principle can be also seen as one of the principles to receive the most user reviews. This can reveal the effectiveness of the reward principle in e-commerce and how users are concerned about such features as loyalty discounts and code discounts.

V. GENERAL FINDINGS, DISCUSSION, AND FURTHER WORK

The results have shown that the majority of users' reviews are related to the primary task support category, with users expressing appreciation for the tailoring, tunneling, and reduction principles in primary task support. This in line with [8], who reported that the reduction, tunneling, tailoring, and self-monitoring principles were the most common principles implemented with ten e-commerce websites. These principles affect users' behaviors through main tasks in selected applications. SHEIN utilizes the reward principle, and users' reviews have shown their satisfaction and purchase activities. By contrast, users of NOON and ASOS did not report such satisfaction and behavior. This also is in line with [8], who mentioned the importance of using the reward principle in E-commerce to motivate users to buy online and to be loyal customers of the online seller. The results show that a number of users' reviews recommend more improvements and recommendation to use different social support activities, such as online support using social networks. This shows the importance of the social role principle; [9] stated that the application of the social role principle helps users to make informed decisions on what and how to buy online. This study found that a number of persuasive design principles are critical to users, as confirmed by their reviews. However, each category could be explored further in order to examine its impact on e-commerce and its priority. This could include statistical correlations tests and detailed examinations of each category. This study focused on users' reviews; this may be expanded to include user interviews to elaborate on comments. This study has examined users' reviews on e-commerce applications, though other domains may also reveal more interesting results, such as medical applications, banking and financial transactions, or e-learning applications.

VI. CONCLUSION

This study aimed to assess how the principles of the PSD model have been implemented in e-commerce applications in Saudi Arabia based on user reviews. The results have shown that tailoring, tunneling, and reduction have been implemented in the selected applications, and users' reviews confirm this. The reward principle has also been reviewed by users, and SHEIN seems to implement this principle most successfully due to users' reviews on the fast delivery and customer satisfaction. The results also show that users' reviews focused on social supports and how they are needed to address concerns instantly. This study reveals further directions to be explored such as the impact of each category on domains such as medical application, e-banking and financial services, and e-learning applications.

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