# Persuasive Recommendations in Ubiquitous Environments

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**Abstract.** Recommender Systems have been traditionally utilized in online environments to personalize product and service offerings and can contribute towards the persuasion of a user to select or consume the recommended items. The present study examines the aforementioned systems in ubiquitous environments and focuses on the persuasive role of customer's motivational conditions to consume a product as well as factors affecting consumers' acceptance in recommendation systems. One of the main insights of the study demonstrates that when a consumer has low motivation to purchase an item then (s)he has the intention to purchase more garments than in the case of high motivation to purchase a particular garment. Furthermore, the present study examines and evaluates the effect of novel and serendipitous recommendations on the above motivational conditions. The results revealed that when a consumer has either high or low motivation to purchase a garment, (s)he gets persuaded by serendipitous garment recommendations while the provision of novel recommendations does not affect the acceptance of recommendations in any of the two motivational conditions.

**Keywords:** persuasion, personalization, novel recommendation, serendipitous recommendation

## 1    Introduction

Recommender Systems are systems that elicit users' tastes and interests in order to filter the available information so as to provide them recommendations (products and/or services) that match their preferences (Xiao and Benbasat, 2007; Bollen et al., 2010; Pu et al., 2012). Recommender Systems may act as enablers of persuasion since they suggest products closer to consumer's need and interests. They have been acknowledged as one of the most successful software tools since both product/service providers and customers gain benefits from their implementation in online environments. Providers may increase their sales as well as increase their customers' loyalty and satisfaction while customers can find effortlessly products and services that match their interests. Until recently, the implementation of recommendation services in physical stores has been a cumbersome task and only with the advent of in-store digital channels (e,g. interactive e-kiosks, digital signage) as well as the utilization of

mobile devices made recommendations feasible. However, providing recommendations in such ubiquitous environments is not straightforward and direct replication of the recommendation process applied in pure online settings.

A key question in recommender systems research concerns its persuasive power and the factors that affect the acceptance of recommendations (i.e. selection of the recommended product) by the consumers. The implicit assumption that the prediction accuracy of recommendation algorithms is probably the most important factor that affects the success of these systems and consecutively their persuasive effect has recently been challenged. Studies suggest that the persuasive effect (i.e. the acceptance) of recommendations also depends upon consumers' personality (e.g. Gkika and Lekakos, 2014) or the presentation of the recommendations (Nanou et al. 2010). The present study focuses on the investigation of whether a recommendation's novelty and serendipity may affect on the acceptance of the recommendation.

The application domain of the present study is a physical female garment store. The scenario assumes that RFID tags are placed on each garment, transmitting product identification information. As soon as a consumer picks up a garment and enters the fitting room, the product info is read by an RFID reader installed. Consumer interacts with a touch screen installed in the fitting room, identifying herself through scanning her loyalty card on the screen. Then, a recommendation system processes the consumer and garment info providing personalized recommendations on the screen. A similar scenario is applicable through consumers' smart-phone. The implementation of a recommendations service in the above setting aims to persuade customers purchase garments as well as accessories taking into consideration how novel (recommendations of new items that the user did not know about before (Celma et al., 2008; Adamopoulos & Tuzhilin, 2013)) and serendipitous recommendations (surprisingly interesting items (Adamopoulos& Tuzhilin, 2013)) affect the acceptance of recommendations. For this purpose, a garment recommendation system was developed in order to evaluate the impact of the above factors through an experiment.

The paper is organized in five sections. In Section 2 the role of persuasion is described and a review of the factors affecting recommendations' acceptance is presented. Section 3 presents in detail the experiment performed and in Section 4 the experimental results are discussed. In Section 5 the main conclusions of this research are analyzed and future work is discussed.

## 2        Background/Hypothesis

### 2.1    Factors affecting recommendations' acceptance

The mainstream of research in Recommender Systems has traditionally been focused on their algorithmic aspect and more specifically on the development and evaluation of algorithms that provide accurate recommendations (Xiao and Benbasat, 2007, Pu et al., 2012). This implicit assumption has been recently challenged since other factors that play also a significant role have emerged (Nanou et al., 2002; Knijnenburg et al., 2012). Such factors based on more user-centric characteristics including recommen-

dation's presentation (i.e. Nanou et al. 2010), the needed effort in order to interact with Recommender System (i.e. Cremonesi et al., 2012), system's transparency or explain to end users how the systems works (i.e. Sinha and Swearingen, 2002; Pu et al., 2011), and recommendation's novelty (i.e. Pu and Chen, 2011). Previous studies have also shown that the majority of the aforementioned factors also affect the persuasive ability of a recommendation, which is defined as '*the attempt of changing people's attitudes or behaviours or both*' (Fogg, 1998). However, in ubiquitous environments, there is quite limited research that examines the above factors. Gkika et al. (2015), investigated the role of personality, customer's style as well as the his/her intention to purchase in accordance with his/her style and his/her motivation state (high or low motivation to purchase) with the acceptance of recommendations. The study suggests that the factors mentioned above do affect customers' acceptance of recommendations.

One of the fundamental theories in persuasion literature is the Elaboration Likelihood Model (ELM) (Petty and Cacioppo, 1986), which describes how information is elaborated by a consumer and how it may influence his/her attitude and behavior. There are two types of elaboration (i.e. the mental effort a consumer spends in order to process an argument) the in-depth elaboration which represents the "central" route to persuasion and the low-depth elaboration, i.e. the "peripheral" route to persuasion. In the case of central route, consumers characterized from both high motivation and ability to process information and get persuaded by the provided information after thorough elaboration of the argumentation (persuasive information). Indeed, along the central route, the quality of argumentation is the most significant factor that affects the persuasiveness of a message, since consumers are engaged into thorough elaboration assessing the provided information. According to Tam and Ho (2005) in personalization applications argument quality can be represented by the extent of "preference matching" of the recommendation, i.e. how close the recommended item is to the preferences of the user. On the other hand, when either the motivation or the ability is low, consumers follow the peripheral route to persuasion. Along this path, consumers need some sort of peripheral cues in order to elaborate the information. Tam and Ho (2005) suggested that peripheral cues such as the sorting or the set size of the recommended items can lead to acceptance of recommendation (i.e. have a persuasive effect) through the peripheral route, in ELM terms. A consumer who has high motivation to purchase a specific product/service then (s)he won't pay much attention and cognitive processing on other products, because (s)he is focused on his/her ultimate purpose. This has as a result other products/services that are not familiar with what (s)he wants not to capture consumer's attention and consecutively not consume more products. On the contrary, a consumer who has low motivation to purchase something it is more possible to look at a variety of products/services. In other words, a consumer's motivational condition may affects the acceptance of recommended products in terms of the amount of products/services (s)he elaborates and consecutively consumes. Thus, the first hypothesis of this study is the following:

*H1: Consumer's motivation to purchase impact the acceptance of recommendations.*

Moreover, Fogg (2009) suggests that when someone has the motivation and the ability to act, as well as an appropriate trigger is provided in order to stimulate his/her response. When one (or more) of the above elements is missing or not is not suffi-

cient, then the individual won't perform the desirable behaviour. When an individual lacks motivation then appropriate triggers should be provided to enhance his/her motivation, in the form of "motivational elements" in order to capture individual's attention so as to persuade him/her to consume the provided recommendations. In the field of Recommender Systems, motivational triggers may be novel recommendations, i.e. recommendations of new items that the user did not know about before (Celma et al., 2008; Adamopoulos & Tuzhilin, 2013) or/and serendipitous recommendations, i.e. surprisingly interesting items (Adamopoulos& Tuzhilin, 2013). The aforementioned motivational triggers may capture users' attention because (s)he has not seen this item/product ever before or potentially cause a positive feeling towards the recommendation (serendipitous recommendations). Moreover, the aforementioned types of recommendations can be characterized as peripheral cues in terms of ELM, which can affect the level of message processing, without excluding the possibility of interacting with a central cue in order to enforce or even reduce the mental processing (Tam and Ho, 2005). Following the above line of thinking, the second hypothesis of this study is:

*H2.1: Novel recommendations impacts the acceptance of recommendations*
  *H2.2: Serendipitous recommendations impact the acceptance of recommendations.*

In order to evaluate the above hypotheses an experiment was conducted as described in the next section.

## 3      Research Design and Methodology

### 2.2      Experiment Design

In order to investigate the above hypotheses a between-groups exploratory experiment was conducted. The experiment participants were invited through posts in University's Facebook groups (e.g. undergraduate, postgraduate and PhD students). The invitation message was asking recipients to participate in a research in which they would be asked to rate recommendations provided by an application. The link to access the system was provided and a clear suggestion concerning the anonymity of their participation was included in the message. The properly completed surveys where 38 in the 'Shopping Therapy' scenario and 33 in the 'Event' scenario, in a total of 71 participants. All users were females while the 46% of the sample ware aged between 18 and 24 years old, the 52% were between 25 and 34 years old and the 2% at the age of 35-44 years old.

The experiment included two different scenarios of the customer experience use case. The first scenario simulates a low motivation shopping behaviour, where consumers visit the store without a clear intention to buy something. This "Shopping therapy" scenario differentiates from the second scenario, which simulates a high motivation scenario where consumers visit the store in order to perform a planned purchase (e.g. a garment for an important event). The distinction of the two scenarios was necessary since (according to the Elaboration Likelihood Model) users with different level of

motivation levels respond differently to motivational triggers with respect to the acceptance of recommendation.

In the first scenario experiment participants were asked to imagine that it is Saturday morning and they were going for "shopping therapy" while at the second scenario they are supposed going shopping in order to purchase a garment for an important event to them (e.g. a special dinner, a date, an appointment), which would take place that day. Consecutively, in both scenarios, experiment participants were asked to imagine that they enter a physical store in which a number of recommendations (24 in total) were provided on a touch screen monitor mounted in the fitting room.

At the first step of the experiment, six groups of garments were presented to the participants (i.e. six web pages with four garments each: Fig. 1 and Fig. 2). The participants were asked to provide ratings (1 to 5 scale) concerning how much they like the recommended garment as well as how close it is to their perception of (their own) style. In a similar manner they were asked if they believe the recommended garment is novel and serendipitous, and finally they were asked to state whether they would purchase the recommended item or not. The questions concerning novelty "I have never seen this garment before" and serendipity ("I have never seen this garment before" and "I was surprised by this recommendation") were utilized from previous studies (Celma et al., 2008; Adamopoulos & Tuzhilin, 2013).
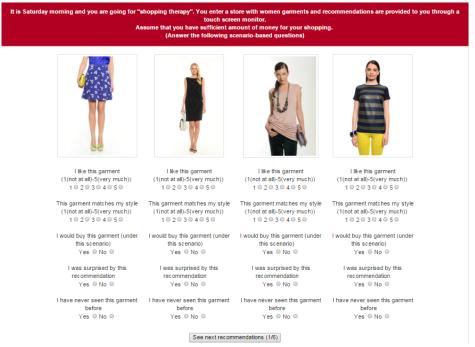


**Fig. 1.** Recommended garments and associated questions('Shopping Therapy' scenario)
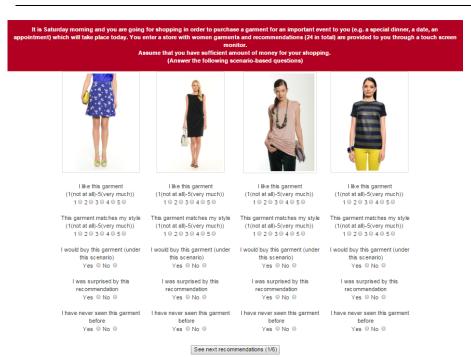
**Fig. 2.** Recommended garments and associated questions ('Event' scenario)

At the second and last step of the experiment, a final questionnaire was provided which contained a few demographic questions.

## 3.2    Survey Results

In order to examine whether the consumer's motivation to purchase affects the amount of products (s)he purchase (H1), we measured and compared, for both scenarios (Shopping Therapy Scenario – Event Scenario), the average means of the garments that the participants had declared their intention to purchase (Table 1). The paired t-test results indicated that there are significant differences ($p<.05$) for the aforementioned metric between the scenarios. Hence, we accept H1, i.e. consumer's motivation does play a role in their intention to purchase the recommended garment.

**Table 1:** T-test Results for H1: Consumer's motivation to purchase impacts the acceptance of recommendations

| Shopping Therapy Scenario – Event Scenario | | |
|:---:|:---:|:---:|
| **Mean** | St. Deviation | Sign |
| **1.667** | 4.105 | .035 |

Moreover, in order to investigate if novel and/or serendipitous recommendations increase recommendations' acceptance, when (s)he has high or low motivation to pur-

chase, a paired t-test was conducted between the average of garments' ratings that are perceived as novel and the average of garments' ratings that are not perceived as novel, and similarly for the case of serendipity. The t-test results suggested that in case of novel recommendations, there are no statistically significant differences either in the case of Shopping Therapy Scenario (low motivation to purchase) or in the case of Event Scenario (Table 2 & 3). Consecutively, there is not increase the acceptance of recommendations in the case of novel recommendations, so H2.1 (Novel recommendations impact the acceptance of recommendations) is rejected. On the contrary, in the case of serendipitous recommendations the H2.2 (Serendipitous recommendations impact the acceptance of recommendations) for both scenarios is verified.

**Table 2:** T-test Results for H2.1: Novel recommendations impacts the acceptance of recommendations

| Scenario | Average of novel garments – Average of non- novel garments | | |
|---|---|---|---|
| | Mean | St. Deviation | Sign |
| **Shopping therapy** | .56 | 1.712 | .061 |
| **Event** | -.479 | 1.224 | .057 |

**Table 3:** T-test Results for H2.2: Serendipitous recommendations impacts the acceptance of recommendations.

| Scenario | Average of serendipitous garments – Average of non- serendipitous garments | | |
|---|---|---|---|
| | Mean | St. Deviation | Sign |
| **Shopping therapy** | .975 | 1.02 | .000 |
| **Event** | 1.065 | .0936 | .000 |

## 4 Conclusions and Future Work

The present study investigates the persuasive role of customer's motivational conditions (high or low motivation) to consume a product as well as the persuasive effect of novel and serendipitous recommendations. Experimental results indicate that when a consumer has low motivation to purchase then (s)he actually purchases more garments than the garments (s)he purchases in the case of high motivation. The business implication is that when an individual has low motivation to purchase then a variety of garments and accessories should be recommended. On the contrary, in the case of high motivation, when a consumer wants to buy a particular garment then (s)he won't waste his/her time looking around other type of garments. In that case, garments of the same style and category (e.g. dress) should be recommended.

A second implication is that garments should be recommended according to the "reason" why an individual goes for shopping. For instance, in the case a customer goes for shopping so as to purchase garments for an "event", she is having the motivation to buy only what she needs, that means that she won't looking for other types of garments and the provided recommendations should be of the same style and category of garment.

Customers' sometimes go shopping for fun (i.e. "shopping therapy"), and they do not necessarily need to purchase something (low motivation to purchase) while in other occasions they intent to go shopping for a particular reason (high motivation to purchase) e.g. for a wedding or a special event. In the  "shopping therapy" scenario, where a consumer is less motivated (i.e. "shopping therapy") to purchase a garment, (s)he gets persuaded by serendipitous garment recommendations, garments that capture his/her attention and make him/her to feel surprised. On the same vein, as for the "event" scenario, just a novel garment, might make him/her feels strange and uncomfortable because (s)he is not familiar with  this garment. For this reason, recommender systems designers should be able to identify someone's motivational condition for shopping so as to recommend (or not) him/her novel and/or serendipitous products.

Certainly, the study presented in this paper has limitations. First, the sample size is rather small to derive conclusive results. Further extension of the experiment to a larger and more diverse group of user will provide additional validity support to the findings. Furthermore, the above results provide insights only for women behaviour, so it would have been interesting to examine the same conditions on men as well. This could have been an extension of the present study. Moreover, the next steps of the present study also include the study of additional factors (such as individuality) that may impact the acceptance of recommendations. It is also planned to apply the above scenarios within a real garment store in order to measure the effect of other contextual factors (such as the effect of the consumer's effort required to interact with a recommendation systems in the fitting room).

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