Understanding Consumer’s Acceptance of Technology-Based Innovations in Retailing

Eleonora Pantano¹ & Loredana Di Pietro²

Abstract

The availability of a huge number of studies about the Technology Acceptance Model (TAM) for predicting consumer’s acceptance and usage of innovations in points of sale motivates writing of the present. Review, with emphasis on the new variables integrated in the traditional model. This is concerned with a synthesis of the current progresses in the field, thus offering a unified view of consumers’ behaviour towards new technical solutions. Such synthesis is achieved from an extensive literature analysis, including computer science, innovation, human-computer interaction, and technology management perspectives. For each case, both opportunities and issues are outlined in order to advance the current knowledge and highlight what practitioners and scholars should take into account for developing new and efficient corporate strategies.

Keywords: technology acceptance model (tam); technology adoption; innovation; consumer’s behaviour; retailing.
Introduction

The last decade has seen an increasing interest towards the application of Information and Communication Technologies (ICT) in several fields. While early contributions to retail domain focused mostly on developing of e-commerce and e-banking services, more recent works have been investigating the best practices to design advanced technologies, in order to improve traditional physical points of sale as well (Pantano and Corvello 2010; Willow 2010). From a consumer’s point of view, the benefits provided by such technologies are several. First, they are able to improve the offered services. Second, they can support consumers’ decision-making process. Third, they can enhance the shopping experience (Simmons and Istock 2003; Vieira 2010). Thus, it should not be a surprise that, recently, many interactive tools have been introduced in traditional stores, such as interactive kiosks and floors, in-store displays, smart-mirror, RFID systems, virtual salesperson, shopping assistant systems based on shopping trolleys and handled devices (Chiu et al. 2010a,b; Dennis et al. 2010; Kim and Niehm 2009; Vijayaraman et al. 2008), and anthropomorphized shopping assistants, and immersive environments (Jin 2009; Pantano and Laria 2012; Pantano and Servidio 2012). These in fact can make traditional stores more attractive and aesthetically appealing, thus influencing consumer’s shopping behaviour.

The main feature characterizing these technologies is their capability to provide detailed and constantly updated information on products and services available in the stores (i.e., price, promotions, special discounts, etc.), which users can access through entertaining and user-friendly interfaces (Breugelmans and Campo 2011; Willow 2010). As a consequence, stores may become more appealing and more convenient in terms of time, place, and purchasing modalities, hedonic value (Hsiao 2009; Yoon and Kim 2007); they may be enhanced to enhance the shopping experience with benefits for the consumers shopping mode choice. Hence, the advanced technologies in the one hand provide customized information and services which consumer can access according to his/her own needs (Puccinelli et al. 2009; Reinders et al. 2008); in the other they provide managers information on consumers’ behaviour, preferences and market trends (Chiu et al. 2010a,b; Ochi et al. 2010). This rising interest in designing advanced tools also for retailing follows the increasing awareness in the consumers' increasing power and possibility to choice among alternatives, as well as on the opportunities for co-creating innovative products and services (Berry et al. 2010; Alexander et al. 2009; Eastlick et al. 2012; Weng et al. 2012).

Previous studies on users’ acceptance of new technologies mainly focused on the exploitation of Technology Acceptance Model (TAM) (Davis 1989), which can be successful-ly applied also at retailing and consumers’ usage of a new system in the points of sale (Pantano and Servidio, 2012). Hence, there is a huge amount of studies on the extended TAM, thus the need of a review able to synthesis the current progresses in this direction emerges for proposing a unified view of consumers’ behaviour towards the new technical solutions in the points of sale. The aim of this paper is to provide a more comprehensive view of current researches in marketing and management studies, by reviewing the extant literature on TAM for advanced technology-based innovations for retailing including computer science, innovation management, human-computer interaction, and technology perspectives. We pursue this objective by reviewing studies that provide summaries of the variables and key findings of papers that directly address TAM. To achieve this task, we outline opportunities to enrich the knowledge of the phenomenon along with issues that practitioners and scholars should take into account for the development of new and efficient corporate strategies.

The first part of the paper is devoted to the definition of emerging lines of inquiry and discussions of the theoretical contributions to the overall understanding of the phenomenon; whereas the second one focuses on the avenues for future perspectives, research methods and directions, suggestions on possible overviews for improving understanding of theoretical and practical issues emerged from the analysis.

Conceptual framework

In the last decades an important line of inquiry focused on users’ acceptance of new technologies has emerged, by understanding the main variables able to predict the actual usage of a system, in order to properly tailor new services and products to the market based on Technology Acceptance Model (Davis, 1989). In fact, literature proposes a wide range of successful applications at several sectors, such as e-learning (Liu et al. 2009; Liu et al. 2010), e-commerce (Pavlou 2003; Yoon 2009; Wu and Wang 2005), hospitality and tourism (Casalò et al. 2010, Chang and Caneday 2011; Kim et al. 2008; Kim et al. 2009), learning (Wan Ismail 2012) and so on. In particular TAM is based on the Theory of Reasoned Action (TRA) (Fishbein and Ajzen 1975) with the purpose to describe computer usage behaviour. Initially, it has been largely involved to predict Internet adoption, by mainly focusing on the constructs of perceived ease of use and perceived usefulness, attitude and behavioural intention (Figure 1). While perceived usefulness is related to the utility value emerging from the system usage and it can be defined as the degree to which a person believes that using a certain technology will enhance his/her performance (Kim et al. 2008; Lee et al. 2005), perceived ease of use represents the degree to which a person believes that using the particular technology will require no effort (Kim et al. 2008). Both these
variables affect the attitude and the subsequent behavioural intention (Kim et al. 2009). Attitude represents user’s assessment toward the technology, whereas the behavioural intention represents the degree to which the user is willing to perform certain behaviour.

TAM has been further extended with several sets of acceptance determinants for developing subsequent prominent models capable of better predicting user’s behaviour across different fields of application (Venkatesh et al. 2003; Venkatesh et al. 2012).

Authors identified the importance of Technology Acceptance Model also for retail sector, due to the increasing number of possible technical solutions (Pantano and Servidio 2012). This sector includes both the applications at the physical point of sales (i.e. new automatic cash desk) and virtual ones (i.e. virtual sellers). A common attempt to investigate consumers’ acceptance of new technologies in retailing focuses on their attitude towards ecommerce and eservices (Han and Jin 2009; Ha and Stoel 2009; Hernandez et al. 2010; Shen and Chiu 2010; Udo et al. 2010; Wu 2010) such as electronic payment modalities (Kim et al. 2010; Schierz et al. 2010), online recommendations (Baier and Stuber 2010; Kowatsch and Maass 2010), internet banking (Al-Somali et al. 2009; Alsajjan and Dennis 2010; Lee 2009; Muller-Seitz et al. 2009; Vrechopoulos and Atherinos 2009; Yoon 2010, Yousafzai et al. 2010), as well as self-service systems (Chen et al. 2009a; Dimitriadis and Kyzeris 2011; Lee et al. 2011; Liu et al. 2012; Oghazi et al. 2011; Weng et al. 2012; Eastlick et al. 2012; Pantano and Viassone 2012); whereas other studies in the broad domain of physical stores focus on the introduction of technologies such as RFID, smart mirror, smart shopping trolleys and so on. Event if these studies follow the common approach supported by TAM, they show an absence of a dominant perspective in the field of retailing by adding a wide range of variables (i.e. social influences, informative functions, facilitating conditions, system quality, etc.).

Literature review method

As indicated by Greenhalgh and Peacock (2005) and Ravasi and Stigliani (in press), the selection of research results merged a protocol-driven methodology (the search strategy is defined at the beginning of the study) with a snowballing technique (the search strategy emerges as the study unfolds). Following the authors, we first used databases including the ScienceDirect, IEEE Explore, ACM Digital Library and Scopus search engines in order to provide a broad review of the current literature on Technology Acceptance Model. In this way, the expected outputs represent the most important academic contributions related to consumer’s acceptance of new technologies in physical and virtual points of sale.

Due to the large amount of technologies introduced in past decades, we decided to focus just on the most recent technologies. To achieve this task, we limited the research to works published from 2009 to present.

Since several terms may potentially refer to TAM, we used a number of words or phrases in titles or as keywords, we retrieved all papers published in the “Business and Management”, “Marketing” and “Computer Science” categories of the databases with titles, abstracts or keywords containing the expressions “technology acceptance model” and “consumer acceptance”. This criterion generated an initial set of more 450 contributions. In order to accurately screen the initial set of works, we read all the abstracts and searched for studies on TAM in retailing, and for conceptual articles that advanced understanding of TAM, all written in English. In addition, in order to identify papers potentially missed in such searches, we conducted targeted searches of journals with heavier focus on these topics in the Scopus database, as well as the Elsevier and Emerald databases. We also conducted manual searches of numerous reference lists to identify additional relevant papers and searched an electronic library catalogue for relevant contributions. This further round yielded 11 additional articles. Subsequently, we filtered through the bibliographies of the articles selected.
so far, searching for additional TAM articles not captured by previous rounds of review. This branching and cross-referencing method allowed us to add 18 additional articles.

The focus of the search was exclusively within peer-reviewed journal articles from a range of international sources. We excluded short essays reporting personal reflections and articles that, although containing an overview of the topic/abstract, referred to TAM only marginally and really focused on other issues, such as new technology ventures and the management of other information and communication systems. This round of review led us to select 130 articles published between 2009 and 2012 (August): 35 of 2009, 38 of 2010, 42 of 2011, 15 of 2012 (August). These numbers reflect the emergent nature of the topic.

At this stage, we carefully read the content of each article and began to map the selected literature in order to identify core themes, reflecting various streams of research in investigating different aspects of TAM. Following past reviews in management and marketing studies, we exploited two combined criteria for the classification of outputs: (i) the conceptualization of the object of analysis, and (ii) the specific research topic and focus of investigation. Hence, we first categorized articles on the basis of their explicit or implicit conceptualization of TAM (i.e. TAM for the use of

<table>
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<tr>
<th>Frequency</th>
<th>Variable</th>
<th>Definition</th>
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<tbody>
<tr>
<td>11</td>
<td>Perceived cost</td>
<td>Consumers’ belief of the cost concerning the new technology usage. If it is high, they will be reluctant to the effective usage, thus high cost of value-added service provided by the technology may negative affective their intention to adopt the technology.</td>
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<td>11</td>
<td>Perceived security</td>
<td>The degree to which a consumer believes that using a certain technology will be secure. It concerns the privacy and perceived risk in transaction, especially when customer has not experience with the electronic service.</td>
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<td>12</td>
<td>Subjective norms</td>
<td>These norms represent the expectations of other people regarding to perform a particular behaviour, thus they represent how a person is influenced by the perception of his/her behaviour by reference people such as family and friends.</td>
</tr>
<tr>
<td>12</td>
<td>Satisfaction</td>
<td>A feeling emerging from the consumers’ experience with a product. This construct measures the assessments of the experience including overall pleasure related with the service received.</td>
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<tr>
<td>12</td>
<td>Self efficacy</td>
<td>Consumer’s judgement of his/her capabilities to perform a certain behaviour. It is strictly linked to the behavioural control (or controllability).</td>
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<td>13</td>
<td>Behavioural control</td>
<td>Personal resources for performing a certain behaviour. Since consumers who need high control are more willing to use the technology which involves them in the co-production of the service, this variable motivates customers to use the technology.</td>
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<td>16</td>
<td>Social influence</td>
<td>Influences of other people in performing such behaviours.</td>
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<td>20</td>
<td>Perceived risk</td>
<td>It concerns the uncertainty involved in purchasing processes.</td>
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<td>30</td>
<td>Trust</td>
<td>A psychological state involving the intention to accept vulnerability of a positive expectations of another behaviour.</td>
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<td>31</td>
<td>Enjoyment</td>
<td>The degree to which consumer perceives a certain technology as pleasant. This represents an emotional state or an intrinsic motivation capable of stimulating consumers in continuing such behaviours. In fact, consumer who exhibits pleasure while shopping are more interested in the entertaining shops in terms of longer and more frequent visits.</td>
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Table 1. The most investigated variable within past literature
mobile recommendations system). Subsequently, to achieve a more fine-grained picture of the structure of the topic, we categorized articles on the basis of their research topic: the focus of their investigation, the questions driving their research and the variables included in the model.

The research has been supported by the MaxQda software, in order to identify the most used variables in the studies mainly based on TAM in retail context. The software allowed coding and classifying each variable introduced in addition to the standard constructs of perceived ease of use, perceived usefulness, attitude, behavioural intention in order to propose an extended model. As a consequence, we were able to identify the new variables and their weight in the analysed literature. From the research 149 new variables emerge. Basing on our results, we ignored the variables introduced in less than 11 works. Accordingly, the most important ones emerged as following (see Table 1): perceived cost (frequency value 11), perceived security (frequency value 11), satisfaction (frequency value 12), self efficacy (frequency value 12), behavioural control (frequency value 13), subjective norms (frequency value 12), social influence (frequency value 16), perceived risk (frequency value 20), trust (frequency value 30) and enjoyment (frequency value 31).

As expected, the analysis produced a synthesis of the review outcome, which would advance our knowledge in the phenomenon and highlight the emerging insights and issues for further researches.

Table 2 summarizes the main variables that represent the core streams of research on Technology Acceptance Model for retailing with the related publications. We classified these streams in order to identify a research agenda and possible methods to pursue this one.

**Extended Technology Acceptance Model: New variables**

We grouped the 10 variables achieved into four main areas of research, to focus on their convergence in explaining the consumer’s acceptance of a new technology, namely perceived technology safety and cost, personal skills, social pressure and hedonic value. In particular, these variables have been grouped according the similarity and the reciprocal influences. In the remainder of the paper, we outline their conceptual foundations and summarize the main findings.

<table>
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<th>Variables</th>
<th>Journals</th>
<th>Authors</th>
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<tr>
<td>Subjective norm</td>
<td>Electronic Commerce Research and Applications (2); IEEE International Technology Management Conference; International Journal of Marketing Studies; Journal of Applied Social Psychology; Journal of Business Research; Journal of Computer Information Systems; Journal of Retailing and Consumer Services; Technology in Society; The Electronic Library; Tourism Management (2)</td>
<td>Alsajjan and Dennis, 2010; Casalò et al., 2010; Chang and Chang, 2009; Kim et al., 2011; Lee, 2009; Lee and Chen, 2010; Nasri and Charfeddine, 2012; Pookulangara and Koesler, 2011; Rouibah et al., 2011; Schierz et al., 2010; Shuang, 2011; Yousafzai et al., 2010</td>
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<td>Self efficacy</td>
<td>The Service Industries Journal; Behaviour &amp; Information Technology; Computers in Human Behaviour (2); Decision Support Systems; Electronic Commerce Research and Applications; European Journal of Marketing; Interacting with Computers; International Conference on Mobile Business; International Journal of Marketing Studies; Journal of Business Research; Journal of Computer Information Systems; Journal of the Operational Research Society; Journal of Retailing and Consumer Services; Technovation</td>
<td>Liu et al., 2012; Al-Somali et al., 2009; Hernandez et al., 2009a; Hernandez et al., 2009b; Hernandez et al., 2010; Irani et al., 2009; Kim et al., 2011; Lee and Chen, 2010; Luo et al., 2010; Nasri and Charfeddine, 2012; Ooi et al., 2011; Pookulangara and Koesler, 2011; Shin, 2009a; Shin 2009b; Sun et al., 2009</td>
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<tr>
<td>Satisfaction</td>
<td>Industrial Management and Data Systems; Advances in EECM; Computers in Human Behaviour; European Journal of Marketing; Information &amp; Management; Interacting with Computers; International Journal of Information Management (2); Journal of Business Research (2); Journal of Consumer Marketing; Telecommunications Policy</td>
<td>Chen et al., 2009; Hernandez et al., 2009a; Hernandez et al., 2009b; Hernandez et al., 2010; Kang and Lee, 2010; Li et al., 2012; Palvia, 2009; Taylor and Strutton, 2010; Thomas and Veloutsou, 2011; Tseng and Lo, 2011; Udo et al., 2010; Yoon, 2010; Yu Jang and Noh, 2011</td>
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<tr>
<td>Social influence</td>
<td>International Journal of Retail &amp; Distribution Management; Behaviour &amp; Information Technology; Computers in Human Behaviour (2); Expert Systems with Applications; IEEE International Technology Management Conference (2); Industrial Management &amp; Data Systems; International Conference on Mobile Business; International Conference on MultiMedia and Information Technology; International Journal of Digital Content Technology and its Applications; Journal of the Operational Research Society (2); Technovation; Tourism Management</td>
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<tr>
<td>Perceived cost</td>
<td>Chiu et al., 2009; Al-Somali et al., 2009; Chen et al., 2011; Chong et al., 2012; Du et al., 2010; Hongxia et al., 2011; Hu et al., 2012; Irani et al., 2009; Jayasingh and Eze, 2009; Pai and Tu 2011; San Martin and Herrero, 2012; Shin, 2009a; Shin, 2009b; Shin and Chiou, 2010; Wei et al., 2009; Wu, 2010</td>
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<tr>
<td>Behavioural control</td>
<td>Behaviour &amp; Information Technology; Computers in Human Behaviour (2); Electronic Commerce Research and Applications (2); IEEE International Technology Management Conference (2); Industrial Management &amp; Data Systems; International Conference on Mobile Business; Journal of Computers; Technological and Economic Development of Economy</td>
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<tr>
<td>Perceived security</td>
<td>Chong et al., 2012; Hongxia et al., 2011; Kim et al., 2011; Ooi et al., 2011; Sawng et al., 2011; Shin, 2009a; Shin, 2009b; Sun et al, 2009; Sun et al., 2010; Ting Pan and Cao, 2011; Wei et al., 2009</td>
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<td>Du et al., 2010; Han and Jin, 2009; Morosan, 2011; Muller-Seitz et al., 2009; Nasri and Charfeddine, 2012; San Martin Gutiérrez et al., 2010; Schierz et al., 2010; Schilke and Wirtz, 2012; Shin, 2009a; Shin, 2009b; Yoon, 2010; Yousafzai et al., 2010</td>
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<td>Benamati et al., 2010; Faqih, 2012; Han and Han, 2009; Han and Jin, 2009; Hongxia et al., 2011; Hu et al., 2009; Hu et al., 2012; Jiang, 2009; Jou et al., 2011; Lee, 2009; Lorenzo-Romerò et al., 2011; Liu and Forsythe, 2011; Luo et al. 2010; San Martin Gutiérrez et al., 2010; Sawng et al., 2011; Shen and Chiou, 2010; Taylor and Strutton, 2010; Ting Pan and Cao, 2011; Tsai and Yeh, 2010; Udo et al., 2010</td>
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sequences of using the system (Lee 2009; Tanakinjal et al. 2010). For instance, people may feel a certain level of risk when purchasing a product through a new technology (i.e. automatic payment via mobile phones), because this usage may increase the vulnerabilities, by causing inhibiting aspects to consumers' eagerness to participate in shopping activities (Lee 2009). Especially in the online channel, consumer's risk perceptions and concerns are primarily related to aspects that may have undesirable consequences upon the overall safety of the whole system, such as (i) problems related to involving the privacy and security of personal information, (ii) the security of online transaction systems and (iii) the uncertainty of the final product quality.

| Table 2. Details of the contributions associated with each identified variable |
|-----------------------------------|-----------------------------------------------|-----------------------------------------------|
| Enjoyment                         | Service Marketing Quarterly; Human Factors and Ergonomics in Manufacturing & Service Industries; Advances in EECM; Behaviour & Information Technology; Computers & Education; Computers in Human Behaviour (4); European Journal of Marketing; Expert Systems with Applications (2); Innovation Management and Industrial Engineering; International Conference on MultiMedia and Information Technology; International Conference on Information Management; International Conference on Management of e-Commerce and e-Government; International Journal Human-Computer Studies; International Journal of Retail & Distribution Management; International Journal of Information Management; Journal of Business Research (2); Journal of Computer Information Systems; Journal of Computer-Mediated Communication (2); Journal of Direct, Data and Digital Marketing Practice; Journal of Hospitality and Tourism Technology; Journal of Promotion Management; Journal of Retailing and Consumer Services; Online Information Review; Psychology & Marketing; Telecommunications Policy | Oghazi et al., 2012; Lee et al., 2011; Al-Maghrabi and Dennis, 2011; Chang, 2010; Chen and Chen, 2011; Chiu et al., 2009; Di Pietro and Pantano, 2012; Di Pietro et al., 2012; Du et al., 2010; Han and Jin, 2009; Ha and Stoel, 2009; Hausman and Siekpe, 2009; Hong et al., 2011; Hu et al., 2009; Jiang, 2009; Kang and Lee, 2010; Kim and Forsythe, 2009; Kim and Oh, 2011; Lee and Chang, 2011; Lee and Chen, 2010; Li et al., 2012; Liu and Forsythe, in press; Liu and Li, 2011; Mäntymäki and Salo, 2011; Oh et al., 2009; Oum and Han, 2011; Shin, 2009a; Shin, 2009b; Teo and Noyes, 2011; Tseng and Lo, 2011; Yu Jang and Noh, 2011 |
| Trust                             | The Service Industries Journal; Advances in EECM; Computers in Human Behaviour (3); Decision Support Systems; Expert Systems with Applications; IEEE International Technology Management Conference (2); Industrial Management & Data Systems; Information & Management (2); Information Systems Frontiers; International Conference on MultiMedia and Information Technology; International Conference on Management of e-Commerce and e-Government; International Journal Human-Computer Studies; International Journal of Information Management (3); International Journal of Retail & Distribution Management; Journal of Applied Social Psychology; Journal of Business Research (3); Journal of Consumer Marketing; Journal of Promotion Management; Journal of Research in Interactive Marketing; Online Information Review; Psychology & Marketing; Technovation | Dimitriadis & Kyrezis, 2011; Al-Maghrabi and Dennis, 2011; Al-Somali et al., 2009; Alsajjan and Dennis, 2010; Chang et al., 2011; Chiu et al., 2009; Chiu et al., 2010a; Choe et al., 2009; Chong et al., 2012; Doong et al., 2011; Faqih, 2012; Ha and Stoel, 2009; Han and Jin, 2009; Jiang, 2009; Li and Yeh, 2010; Li et al., 2012; Lorenzo-Romero et al., 2011; Luo et al., 2010; Oh et al., 2009; Oum and Han, 2011; Palvia, 2009; Shin, 2009a; Taylor and Strutton, 2010; Thomas and Veloutsou, 2011; Wei et al., 2009; Wu, 2010; Wu et al., 2011; Yoon, 2009; Yousafzai et al., 2010; Yu Jang and Noh, 2011 |

**Consumer’s perception of technology safety and cost**

An important line of inquiry emerging from our analysis concerns the consumers’ perception of the technology features, in terms of perceived security, perceived cost, perceived risk and trust. In this area, a set of distinctive features that consumers attribute to the new technology converges, in order to deeply understand how to design a new system in order to influence clients’ beliefs towards the effective usage.

Perceived risk has been defined as the consumer’s perceptions of the uncertainty and the possible undesirable consequences of using the system (Lee 2009; Tanakinjal et al. 2010). For instance, people may feel a certain level of risk when purchasing a product through a new technology (i.e. automatic payment via mobile phones), because this usage may increase the vulnerabilities, by causing inhibiting aspects to consumers' eagerness to participate in shopping activities (Lee 2009). Especially in the online channel, consumer’s risk perceptions and concerns are primarily related to aspects that may have undesirable consequences upon the overall safety of the whole system, such as (i) problems related to involving the privacy and security of personal information, (ii) the security of online transaction systems and (iii) the uncertainty of the final product quality.
Based upon past empirical studies (Lee 2009; Tanakinjal et al. 2010; Gupta and Xu 2010), perceived risk is reported to be an impending factor for consumers to engage online shopping and it negatively influences the behavioural intention to use online channel for purchases. Hence, this variable is strictly connected to the perceived security. Although some authors analysed to what extent the level of perceived security differs from the effective security of the system (Shin 2009a) by showing its effect on trust and intention to use the technology, perceived security can be defined as the degree to which a consumer believes that using that technology will be secure (Chiu et al. 2009; Du et al. 2010; Han and Jin 2009; Muller-Seitz et al. 2009; San Martin Guiterrez et al. 2010; Shin 2009a; Taylor and Strutton 2010). In particular, perceived security represents a threat that creates circumstances, condition, or event that may cause economic hardship to data or network resources in the form of destruction, disclosure, modification of data, denial of service and/or fraud, waste and abuse (Kalakota and Whinston 1997). In the online scenario, security threats usually occur at the network level (the server), the communication channel or the user’s personal computer (the client). Indeed, Godwin (2001) and Liu and Forsythe (2011) reported that security concerns were found to be the major barrier to Internet shopping. Due to the uncertainty involved in purchasing processes, perceived security is important especially in the context of online monetary transactions and when customer has no experience with the technology (Schierz et al. 2010; Yoon 2010), such as in the case of new online banking services (Benamati et al. 2010; Choe et al. 2009; Han and Jin 2009; Hu et al. 2009; Jiang et al. 2009; Lee 2009; Liu and Forsythe 2011; Luo et al. 2010; San Martin Guiterrez et al. 2010; Shen and Chiou 2010; Taylor and Strutton 2010; Tsai and Yeh 2010; Udo et al. 2010).

Perceived cost is strictly linked to the above-mentioned variables, due to its role on the consumer’s attitude towards the usage of a new technology (Choe et al. 2009; Du et al. 2010; Kim and Han 2011; Kim et al. 2011; Shin et al. 2009a, b; Sun et al. 2009; Sun et al. 2010; Tseng and Lo 2011; Wei et al. 2009). In fact, if consumer considers high the cost for using the system, he/she will be reluctant to the actual use. Thus the high cost of value-added service might negative affect his/her intention to adopt the technology. The ambiguous and immature legal environment has also heightened the level of uncertainty associated with Internet shopping channel. Similarly, the lack of face-to-face interactions though channel increases the level of uncertainty, insecurity, anonymity, lack of control, and potential opportunism. These aspects contribute to intensify dramatically the impact of trust especially in the online domain. Therefore, the development of trust mechanism is compulsory for online shopping setting in order to enhance the positive perception of consumers toward online shopping channels and to ensure the continued growth of the channel (Di Pietro et al., 2012). In fact, trust has been found to have also a positive effect on the intention to purchase online (der Heijden et al. 2003). Therefore, trust plays a key role for customers’ shopping decisions. For these reasons, it was successfully incorporated within the TAM structure in shopping setting (Beugelsdijk et al. 2004; Zak and Knack 2001).

Past studies consider trust as an antecedent of ease of use and perceived usefulness (Pavlou 2003; Sun and Han 2002); whereas other ones (Kim et al. 2008) argued that perceived ease of use has a direct positive influence on trust because it can support consumers’ sense of loyalty towards the web-based systems.

According to literature (Al-Somali et al. 2009; Alsajjan and Dennis 2010; Chiu et al. 2009; Chiu et al. 2010b; Choe et al. 2009; Doong et al. 2011; Han and Jin 2009; Ha and Stoel 2009; Jiang et al. 2009; Li and Yeh 2010; Luo et al. 2010; Oh et al. 2009; Palvia 2009; Shin 2009a; Taylor and Strutton 2010; Wei et al. 2009; Wu 2010; Yoon 2009; Yousefzai et al. 2010), trust is a key factor for retail process, with emphasis on e-context, where the exchange relationships between client and vendor is characterized by uncertainty, dependence and risk. Especially in these environments consumer is unable to physically examine products, evaluate seller response, and has access to limited information, thus he/she needs resources to reduce the involved uncertainty in transactions. For this reason, the store/brand reputation influences trust and perceptions about the channel in terms of virtual seller, virtual store, store website perception which affects his/her trust in the seller (Chiu et al. 2010a,b; Alsajjan and Dennis 2010; Chiu et al. 2010). Furthermore, it affects also consumer satisfaction emerging from the experience with the technology (Li and Yeh 2010).

**Consumer’s personal traits**

Another important aspect involved in consumer’s acceptance of technology-based innovations in the stores concerns users’ personal traits, such as skills and abilities. In particular, these concern the self-efficacy and the behavioural control, which emerge as variables able to influence consumers’ decision to use a certain system. In particular, self-efficacy represents consumer’s judgement of own capabilities to perform certain behaviours and it is strictly linked to the behavioural control (or controllability) (Al-Somali et al. 2009; Hernandez et al. 2009a, b, 2010; Irani et al. 2009; Kim et al. 2011; Lee and Chen 2010; Luo et al. 2010; Shin 2009a; Sun et al. 2009). The determinants of self-efficacy are typically found in traits of the individual adopter, such as experience, personal skills and education (Kaseniem and Rautuien 2002). There is experimental evidence supporting the causal flow from computer self-efficacy to system-specific perceived ease of use.
The link is justified on the fact that in the absence of a direct system experience, the confidence in individual’s technology related abilities and knowledge can be expected to serve as the basis for a personal judgment about how easy or hard a new system will be to use.

Hence, self-efficacy has been found to affect technology usage also through its effect on the emotional state of the user by, for example, reducing his computer anxiety and increasing behavioural control (Koufaris 2002). Thus, computer self-efficacy relates to judgments about personal skills with benefits for the spontaneity of the individual while interacting with the system (Al-Somali et al. 2009).

Behavioural control has been defined as human control over specific action or environment (Ajzen 2002; Novak et al. 2000). In particular, it refers to individual’s perceptions of their ability to perform a given behaviour (Novak et al. 2000). Hence, it is determined by the total set of accessible control beliefs about the presence of factors that may facilitate or obstruct performance of the behaviour (Jayasingh and Eze 2009). In fact, this variable motivates consumers to use the technology (Chen 2010; Jayasingh and Eze 2009; Jiang et al. 2009; Kim et al. 2011; Lee 2009; Lee and Sun et al. 2010; Mathwick et al. 2010; Shin 2009a; Sun et al. 2009; Yousafzai et al. 2010) because consumers who need high control are more willing to use a technology that involves them in any decision making process (Di Pietro et al. 2012). Already Mathieson in 1991 found that control was a stronger determinant of consumers’ attitudes, even if he only examined the perceived control as the construct of TAM without effectively incorporating the concept into the model.

Due to the characteristics of online retail context, consumers are subjected to more influences in the virtual store where they are able to interact with an adaptive environment, as a consequence an adaptive and interactive scenario is more appealing for consumers, with benefits for the decision-making process (Pantano and Servidio 2012).

Social pressure

Due to the social pressure in using a particular technology, consumers are subjected to the influence of others with consequences on their attitude towards the usage of a new system (Al-Somali et al. 2009; Du et al. 2010; Irani et al. 2009; Jayasingh and Eze 2009; Pai and Tu 2011; Shin 2009a,b; Wei et al. 2009; Wu 2010; Di Pietro et al. 2012). Hence, a third area of inquiry on variables influencing consumers’ decision to adopt a technology includes the external impressions that people are subject to. These refer to the social influence and to the subjective norms.

Since influence from peers, family, and even the media such as television might influence users to employ a certain technology, social influence has been included in TAM as an important variable affecting the intention to use the new system. In fact, through the influence of others (i.e. through word of mouth), an individual will easily become aware of the advantages of using a particular technical innovation. In particular, social influence represents the degree to which an individual considers important that others believe he or she should use an innovation (Chong et al. 2010). It reflects a normative character in line with variables such as the subjective norm (Wang et al. 2009). Indeed, several studies have suggested that this influence is a critical element in understanding innovation diffusion (Venkatesh et al. 2003; Yq et al. 2011), and it has been referred also as an essential motivator of perceived usefulness (Yq et al. 2011).

Subjective norms are defined as consumers’ perception of whether other people believe they should engage certain behaviour (Pai and Tu 2011). The Theory of Planned Behaviour (TPB) (Ajzen 1991) already identified the subjective norms as key variable for explaining the consumer intention to perform a specific behaviour, as well as the attitude toward the behaviour and perceived behavioural control (Casalò et al. 2010). These norms represent the expectations of other people regarding performing a particular behaviour (Alsajjan and Dennis 2010; Casalò et al. 2010; Chang and Chang 2009; Kim et al. 2011; Lee 2009; Lee and Chen 2010; Schierz et al. 2010), thus they explain to what extent a person is influenced by the perception of his/her behaviour by reference people such as family, friends, partner and others.

According to previous studies (Bhattacherjee 2000; Hung et al. 2003), two other concepts are combined to generate the subjective norms: external influence and interpersonal influence. External influence includes the mass media reports, expert opinions, and other non-interpersonal influences. Since consumers could be directly approached by the persuasive advertising of terminal vendors and operators, interpersonal influence is the influence of others in developing norms that the usage of a particular technology is expected. It has been suggested important especially for explaining the adoption of communication technologies (LaRose and Eastin 2002). It refers to word -of -mouth influence by reference group and it includes friends, superiors and IT experts (Di Pietro et al. 2012).

Hedonic value

Finally, another stream of research emerges on the study of Technology Acceptance Model, which is strictly linked to the hedonic value emerging by the technology usage, in terms of enjoyment and satisfaction.
Enjoyment can be considered the degree to which consumer perceives a certain technology as pleasant (Venkatesh 2000). This represents an emotional state or an intrinsic motivation capable of stimulating consumers in continuing such behaviours (Chang 2010; Chiu et al. 2009; Du et al. 2010; Ha and Stoel 2009; Han and Jin 2009; Hausman and Skiepe 2009; Hu et al. 2009; Jiang et al. 2009; Kang and Lee 2010; Kim and Forsythe 2009; Liu and Forsythe 2011; Oh et al. 2009; Tseng and Lo 2011; Shin et al. 2009a,b). Much emphasis on enjoyment has been discussed and applied to previous research on online retailing (Pantano and Corvello 2010). A huge deal of research indicated the strong positive effects of enjoyment on attitudes toward online retailers (Childers et al. 2001; Eighmey and McCord 1998; Heijden and Verhagen 2004; Lee et al. 2005; Mathwick et al. 2001). In fact, several researches carried out that an entertaining context has a stronger impact on consumers’ satisfaction (Soderlund and Julander 2009) and motivates people in using online technologies (Cheung et al. 2011; Ha and Stoel 2009; Lee et al. 2005). Hence, consumer who exhibits pleasure while shopping makes a more extensive use of that stores (virtual or physical ones) in terms of longer and more frequent visits (Ha and Stoel 2009). In particular, Childers et al. (2001) figured out the strong effects of enjoyment on attitudes toward online grocery shopping and suggested that creating interactive features would differentiate online shopping channel from the physical one; whereas Lee et al.’s (2005) study suggested that richer technology leads to higher enjoyment for achieving a stronger influence on consumers’ attitudes toward online retailers. Hence, enjoyment is positively related to user’s satisfaction with specific technology products (Pantano and Servidio 2012; Wosczynski et al. 2002). For this reason, enjoyment emerges as causal variable on perceived utility and perceived ease of use.

While enjoyment is an emotional state, satisfaction is a feeling emerging from the consumers’ experience with a product (Tseng and Lo 2011; Udo et al. 2010). This construct measures the assessments of the experience including overall pleasure related with the service received and it can be considered as one of the most significant predictors of their subsequent behaviour (Hernandez et al. 2009a, 2009b, 2010; Kang and Lee 2010; Palvia 2009; Taylor and Strutton 2010; Yoon 2010).

Satisfaction is critical for establishing long-term client relationships and, consequently, is significant in sustaining profitability. Customers’ satisfaction is the consequence of experiences during various purchasing stages: (1) needing something, (2) gathering information about it, (3) evaluating purchasing alternatives, (4) actual purchasing decision, and (5) post purchasing behaviour. During information gathering, the new technologies offer consumers extensive benefits, due to the reducing of searching costs, increasing of convenience and choices (Bakos 1998). Yet, online consumers are dependent upon the technology tools information as a replacement for physical contact with salespersons (McKinney et al. 2002). As a result, consumers make inferences about the attractiveness of a product based on: (1) information provided by retailers, and (2) design elements of the new technology such as ease and fun of navigation (Wolfinbarger and Gilly 2001).

Discussion and research agenda

The present study aims at integrating the researches on consumer acceptance of new technologies in retailing into a unified model which includes the main elements of the previously extensions of Technology Acceptance Model (TAM). The first step was to identify the most recent researches on consumer acceptance of technologies in online and offline points of sale, whereas the second one was to figure out the determinants of intention and usage of the technology. Afterwards, these constructs were empirically compared in order to understand the links across variables and studies. As result, the conceptual and empirical similarities were used to propose a unified model that might provide a basic framework for future researches in this direction. In particular, the review carried out in the previous sections show that, so far, TAM has been subject of studies for several disciplines, focusing on different perspectives, and exploiting different important variables not included in the initial model developed by Davis in 1989. Due to the numerous intersections among different areas of the research, we underline some lines for future inquiries across the different disciplines, which would be integrated in a common approach in order to advance our knowledge of the phenomenon from an integrated perspective. These suggestions figure out a promising research agenda (Table 3).

Psychological traits

Investigation of how consumers respond to technology introduction has traditionally carried out by technology adoption researches. In fact, many studies highlighted the importance of users’ psychological traits for predicting the effective acceptance of the new technology. The supposition that those traits are variables of TAM finds considerable support in the attitude-behaviour models from the social-psychology literature (Kim et al. 2011).

Hence, the effective usage of a new system requires some actions by users, thus the design of some technologies could be “better” than others by requiring less mental effort. We believe that additional empirical works are useful to establish more in detail what drives the consumers capacity to adopt a certain technology, as well as to what extent the personal traits influence this adoption and under what
Moreover, the results show a still limited number of works on consumers' innovativeness in retail context, that take into account the personal attitude towards innovation for explaining innovation acceptance and diffusion among vendors; thus the level of innovativeness of the decision-maker would explain to what extent innovations will be introduced in the traditional points of sale. Similarly, both consumers’ and retailers expectations towards a technology-based innovation are able to influence the adoption and diffusion process, thus these aspects need to be further investigated to develop also new diffusion models.

Technical traits

Future research may try to investigate how individual tastes and preferences guide the development of technologies that can be more accepted by consumers. In fact, the success of these technologies is the result of an efficient design and human widespread tastes and preferences. The system-related conditions consumers are more willing to accept the new system (i.e. store atmosphere, layout, etc.). In fact, the introduction of new technologies in the stores can substitutes the face-to-face contact with a real seller (Kang and Lee 2010; Oh et al. 2009; Shin et al 2009b; Udo et al. 2010), for this reason trust emerges as the most motivating factor in the adoption. Since satisfaction and expectations towards technology usage influence consumers’ acceptance, another interesting inquiry of research concerns the conditions that can positively influence consumers’ satisfaction towards the technology usage and fulfil the expectations. How the technology will solicit consumers’ emotion to obtain a certain behavioural response?

Other issues may investigate their response towards the introduction of technologies like the self-service ones that do not require the presence of a physical vendor. As a consequence, the client-vendor relationship will dramatically change and will need to be further investigated.

Table 3. Issues for future research on advanced technologies management for retailing

<table>
<thead>
<tr>
<th>Areas of research</th>
<th>Research topic</th>
<th>Core research questions</th>
</tr>
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<tbody>
<tr>
<td>Psychological traits</td>
<td>Identification of consumers skills</td>
<td>What are consumers skills requested for the actual usage of a new technology? How do personal traits influence consumers’ technology adoption? Under what conditions are consumers more willing to accept the technology? Under what conditions are consumers satisfied to use the technology? How do consumer’s expectations influence technology adoption?</td>
</tr>
<tr>
<td>Technical traits</td>
<td>Identification of consumers needs and requests</td>
<td>How technology has to be designed to reflect consumers’ need? How does information management influence technology adoption? How can technology reply to consumers’ request of entertaining? How can technology enhance consumers’ shopping activity? How will store layout change according to technology adoption? How can technology be designed to allow access privileges or security and privacy?</td>
</tr>
<tr>
<td>Innovation co-creation process</td>
<td>Understanding opportunities, strengths and modalities of consumers involvement in the co-creation process of retail innovation</td>
<td>How innovations for retailing might be designed by consumers? How does consumers’ involvement in co-creation influence technology adoption and retail process? How will retail process change according to these innovations? How will organization reply to these innovations in the retail process?</td>
</tr>
<tr>
<td>Adoption results</td>
<td>Contextual conditions and profitability of technology acceptance</td>
<td>Which kind of technology would be more beneficial to a firm and under what conditions? Are certain types of technologies more or less appropriate to certain types of products in sale? What factors do influence the capacity to profit from innovation capabilities in the development of technical solutions for retailing? What makes a technology-driven strategy sustainable over time? To what extent does the development/introduction of new technologies require new retailing business models?</td>
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technical traits will enhance usability of the system because users will be able to perform their tasks quickly. Furthermore, if the system is user friendly, user may feel a more a greater control over the system, with benefits on the self-efficacy toward the system usage.

Technical traits are critical for at least two interrelated reasons: (i) minimization of (consumers’) initial resistance to a new system, and (ii) providing a realistic view of the system in order to provide potential consumers both an accurate perception regarding system features and how the system may help them performing their purchase decision process (Venkatesh 2012). The research in this direction would focus on the interaction and input modalities, by also exploiting and adapting the recent developments in the game industry. Since the technical innovations in retailing are becoming increasingly complex and central for consumer’s decision making and the adoption of new disruptive (radical) systems substantial changes the store layout dramatically, the technology-based innovations in the points of sale are subject to severe resistance by consumers. Hence the information about the new technologies plays a role in consumer’s intention to use. Due to the risk related to the information overload (Chen et al. 2009), future research would focus on how to exploit the new technologies for increasing the provided information and make them customized on consumers’ needs, by avoiding the risk of overload.

Other key questions concerning the technology development are: How can technology enhance consumers’ shopping activity? How will store layout change according to technology adoption? How can technology be designed to allow access privileges or security and privacy?

Innovation co-creation process

The current researches in involving users in the co-creation process forces retailer to consider the opportunities emerging from the consumers’ involvement in the innovation development (Alexander et al. 2009). In fact, if they are active participants in the development process, they will be more able to adopt the emerging innovation, which will be highly customized on their needs and preferences. For instance, the development of innovative adaptive technologies and the improvements of self-service technologies would be able to maximize the acceptance of the system and emerging value for consumers. A critical issue will concern how to exploit consumers’ knowledge and how to solicit their creative contribution for developing the retail process by introducing new technical solutions, and on the importance of consumers’ role for innovation process.

Hence, in this scenario, new critical aspects need to be further investigated: how it will be possible to code and manage the input data emerged by consumers’ involvement? What are the technologies able to better support this process? How many consumers need to be involved to have reliable and efficient data for enhancing the development process? How the firm will be able to manage consumers’ input data?

Adoption results

Several evidences from research in marketing, management, innovation and technology suggested that the introduction of new technologies might affect positively the retailers’ performance, with benefits for firms’ profitability. In fact, due to the introduction of new technical solutions in the points of sale, consumers may feel that the new system will threaten their existing routines and habits and change the nature of their relationships with vendors, with consequences for brand/firm image.

Hence, further studies would explain more observations on to what extent the development/introduction of new technologies will require new retailing business model, and which factors will influence the capacity to profit from innovation capabilities in the development of technical solutions for retailing. Similarly, a further line of inquiry may lie in the firm’s dynamic capabilities for being able to appropriate successfully all the benefits these innovations generate.

Since most of the current studies on introduction of advanced technologies in the point of sale mainly focus on the analysis of the consumers’ point of view, a fine-grained comprehension of how these changes in retail business models can be carried out and co-ordinated in organizations represents a stream of research upon which further studies would rely. In particular, we suggest a punctual analysis on managerial interventions, specific management actions and policies, dynamic capabilities triggered by the introduction of these technologies for increasing the firm’s profitability. In this way it will be possible to advance our knowledge on the technology adoption and diffusion among organizations, as well as to predict the future direction.

Moreover, other studies could achieve data on how to manage the innovation process in the store for defining possible frameworks for a successful adoption process and an efficient innovation-driven retailing, for instance by exploit the open innovation strategies for involving end-users in the development process (Carlsson et al. 2009).

Conclusions

While the power of Information and Communication technologies in the shopping experience increases constantly, customers’ expectations also rise, by forcing retailers to fast prompt to market instability. The global usage of new tech-
nologies will dramatically change the interactions between consumers and retailers and requires new efficient retailing business models, as anticipated by Sorescu et al. (2011).

In this scenario, the present work advances our knowledge on the consumers' acceptance of new technologies in the points of sale, in both online and offline context, and explores the newly extended concept of Technology Acceptance Model (TAM) represents one of the most widely used models for describing an individual's acceptance of information systems. Though previous studies including review of TAM antecedents and meta-analysis, the present work has tested the applicability and the convergence of TAM relationships across various fields. This study differs from past reviews due to its attempts to develop an integrating map of TAM based on the most important variables: perceived security, perceived cost, satisfaction, self-efficacy, behavioural control, subjective norms, social influence, perceived risk, enjoyment, and trust (see Table 1). We accomplished this study by identifying four main categories of TAM's variables: consumers' perception of technology safety and cost, consumer's personal traits, social pressure and hedonic value. This research unifies the theoretical perspective expressed in the current literature and includes the main variables emerging from the most recent studies in the sector, by underlying the main role played by the trust construct.

In our expectation, this study may serve as a benchmark for future researches to investigate developments in the TAM field and to record the emergence of new research areas by incorporating more newly published papers over time.

In addition, the review encompassing across different fields highlights opportunities for new integrated streams of research, by revealing powerful intersections on areas of marketing, management, computer, science, and psychology (see Table 2).

Although researches on consumers' behaviour have widely acknowledged the importance of usefulness, ease of use, other opinions and enjoyment for predicting the adoption of a new technology in retail context, there is still a lack in the knowledge of how these technical innovations will change the traditional retailing business models and to what extent these ones can be co-ordinated in organizations for achieving a certain profitability.

Finally, there is the need of new researches in the concept of advanced technologies and innovation management for retailing as well as the need of the development of deeper measurement scales which enable the components states to be verified and measured in order to make more detailed previsions on future consumer's behaviours.

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