

# Dual Information Systems: A Review Of Factors Affecting Their Use

*Completed Research*

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## Abstract

More and more information systems (IS) are designed to address a blend of hedonic and utilitarian purposes, and hence become what information system scholars call today “dual systems.” The aim of this research is chiefly to provide a holistic perspective for research done regarding dual IS (i.e., what factors affect users’ adoption and post-adoption of these systems) in order to assess the state of knowledge in this area and to provide a reference point for system designers. To achieve this goal, we started out with a systematic literature review (35 articles), and analyzed the articles in terms of their theoretical background, constructs and findings. The results suggest that there is an increasing number of systems that are regarded as dual (e.g., gamified services, virtual worlds) and that the influential factors can be grouped according to the three dimensions of IS artefacts: information artefact, information technology artefact and social artefact.

## Keywords

Dual Information Systems, Influential Factors, Hedonic, Utilitarian, Systematic Literature Review.

## Introduction

The difference between IS according to their use purpose (e.g., hedonic vs utilitarian, work vs leisure) is increasingly becoming vague. The growing use of mobile services, the emergence of Web 2.0 and its corollary user generated content, and design strategies such as gamification have blurred the reasons why people engage with a system. Many IS that were designed for hedonic purposes are now used also for utilitarian reasons. For instance, Twitter is used as a newsfeed or a tool for political campaigns (Köse et al. 2016) and Facebook is used as a marketplace to buy and sell goods (Griffin 2016). On the other hand, gamification is used to enhance hedonic value of otherwise utilitarian services (Hamari and Koivisto 2015a) such as in the areas of crowdsourcing (e.g., (Melenhorst et al. 2015)) and education (e.g., (Domínguez et al. 2013)). Therefore, today many IS can be seen as dual systems that are used for both hedonic and utilitarian benefits according to the context of use or the task carried out (Gerow et al. 2013; Wu and Lu 2013).

However, previous research has not recognized this convergence when they in essence study dual IS. For instance, many previous studies viewed online social networks as hedonic only systems (e.g., (Gerow et al. 2013; Kefi et al. 2010; Sledgianowski and Kulviwat 2009; Wu and Lu 2013)) or focused only on their hedonic aspects (Xu et al. 2012). However, increasing number of studies show that they are also used for utilitarian purposes (e.g., (Köse et al. 2018; Xu et al. 2012)). Another example is games: They are seen solely as hedonic systems although they are now used for a variety of utilitarian purposes (e.g., serious games, simulation games) (Hamari and Keronen 2017). However, it is also easy to find studies that only recognize their utilitarian aspects because of their use contexts (e.g., (Bourgonjon et al. 2010; Hwang et al. 2013)). Those research with non-cognizance of dual systems might have studied the factors influential in adoption and post-adoption of these systems in a skewed manner. Therefore, they may overlook those aspects that may affect users’ perception of these systems. In addition, designers and managers may lack a balanced view in the development and marketing processes of these technologies. Accordingly, our purpose in this study is to review which factors in the literature are observed to affect the use of dual systems.

To achieve this goal, we conducted a systematic literature review that covered acceptance and continued use of those systems that were overtly identified to serve dual purpose. In other words, we studied the research that recognized their subject system as dual, mixed, multi-purpose, convergent or serving both hedonic and utilitarian purposes. As a result of this review, we synthesized the factors we found into two testable models – one for adoption and the other for post-adoption of dual systems. Researchers may benefit from these models in identifying those concepts related to their research questions and make more informed decisions when including or excluding them in their empirical work. Practitioners, on the other hand, can develop their understanding with respect to design of these systems, and pay attention to the factors that were found to be influential at the design, development and marketing stages.

## **Methodology**

We conducted a systematic literature review of the studies related to adoption and post-adoption of dual IS. We followed the guidelines provided by Webster and Watson (2002) and Boell and Cecez-Kecmanovic (2015). We used Scopus multidisciplinary database as our data source because it provides a comprehensive list of relevant articles. In addition, focusing only one database ensured that our protocol for literature selection is transparent, replicable and rigorous (Boell and Cecez-Kecmanovic 2015).

Our literature search was conducted in September 2018. We limited our search to the title-abstract-keyword in order to increase the number of relevant documents found. Our search string consisted of combinations and variations of terms that are reflective of duality (e.g., “dual information system”, “utilitarian and hedonic”), adoption (e.g., “technology acceptance”, “technology adoption”) and post-adoption (e.g., “continuance”, “discontinued use”, “post-adoption”). These concepts are well established in the IS field; therefore, we did not limit our search to specific disciplines or outlets to reach as many documents as possible. The full version of the search string may be found in the appendix.

This search resulted in 94 documents. We screened these papers according to the following inclusion criteria: (1) The full paper can be reached, (2) The paper is a full research paper (conceptual and research-in-progress papers were excluded), (3) The subject information system of the research is explicitly recognized as a dual system (4) The paper analyses the effects of different factors on adoption or post-adoption of IS, (5) The paper is in English and was published in an international peer-reviewed outlet. As a result of this screening process 35 papers were included in this review.

The selected papers were analyzed according to the guidelines provided by Webster and Watson (2002). In other words, we studied their research model (e.g., dependent and independent variables), data analysis method (e.g., experiment, multi-group analysis) and theoretical basis to extract concepts that were influential on adoption or post-adoption of the subject system. For qualitative papers, we studied the findings of the papers to identify the influential factors.

## **Findings**

The literature review showed that various types of technologies were self-proclaimedly studied as dual systems. Previous meta-analysis studies classified search engines, instant messaging, mobile Internet, Web use, personal computer, mobile devices, mobile services, email systems, short message services, online newspapers and blogs as dual IS (Gerow et al. 2013; Wu and Lu 2013). Our review showed that online shopping services (e.g., (Childers et al. 2001; Chiu et al. 2009; Lee et al. 2006)), mobile data (or Internet) services (e.g., (Deng et al. 2010; Wakefield and Whitten 2006; Yang and Lee 2010)), social networking services (e.g., (Chen and Fu 2018; Pillai and Mukherjee 2011)), gamified services (e.g., (Hamari and Koivisto 2015a)), virtual worlds (Barnes 2011; Liu et al. 2013; Zhou et al. 2014), mobile devices (Chun et al. 2012; Kulviwat et al. 2014; Wakefield and Whitten 2006), online multi-player games (Chang et al. 2014) and mobile museum guides (Pianesi et al. 2009) were proclaimed as dual systems. This result expands the types of systems that are acknowledged as dual in previous studies. To be more specific, it adds online shopping services, social networking services, gamified services, virtual worlds, online multi-player games and mobile museum guides to this group.

Majority of the studies investigated the phenomenon from the theoretical standpoint of technology acceptance model (TAM) (Davis 1989; Davis et al. 1992) especially related to the adoption of information systems. On the other hand, for the studies that investigated post-adoption, the theoretical approaches were

more varied but were still strongly connected to the established expectation-confirmation theory (ECT) literature (Bhattacharjee 2001; Bhattacharjee and Lin 2014). Therefore, we created two models to show the effects of the identified constructs based on these two theories. Figure 1 and Figure 2 present the resulting models in detail for TAM-based adoption and ECT-based post-adoption of dual IS respectively.

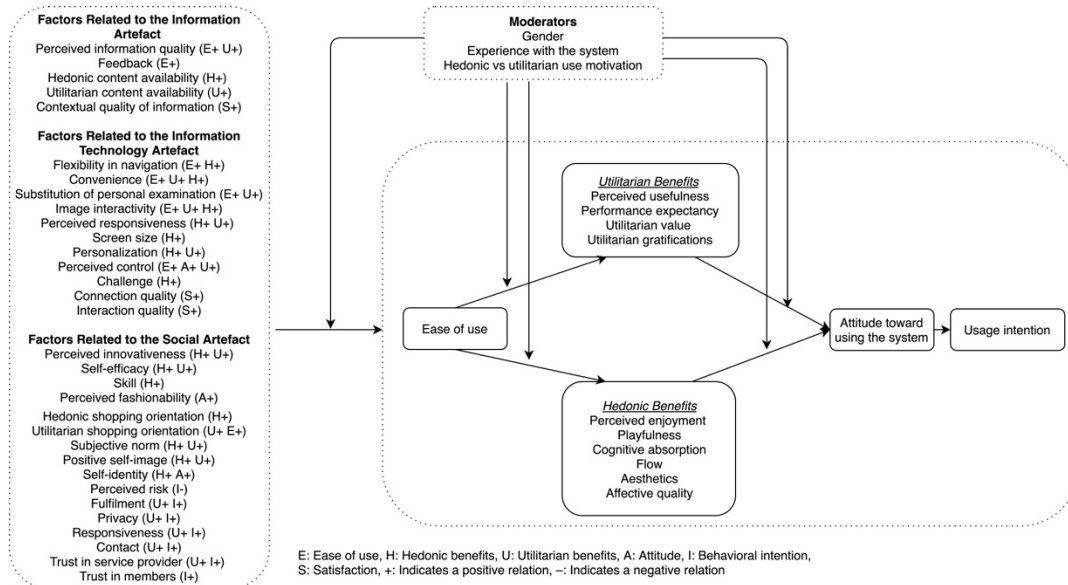


Figure 1. TAM-based model of factors affecting acceptance of dual IS

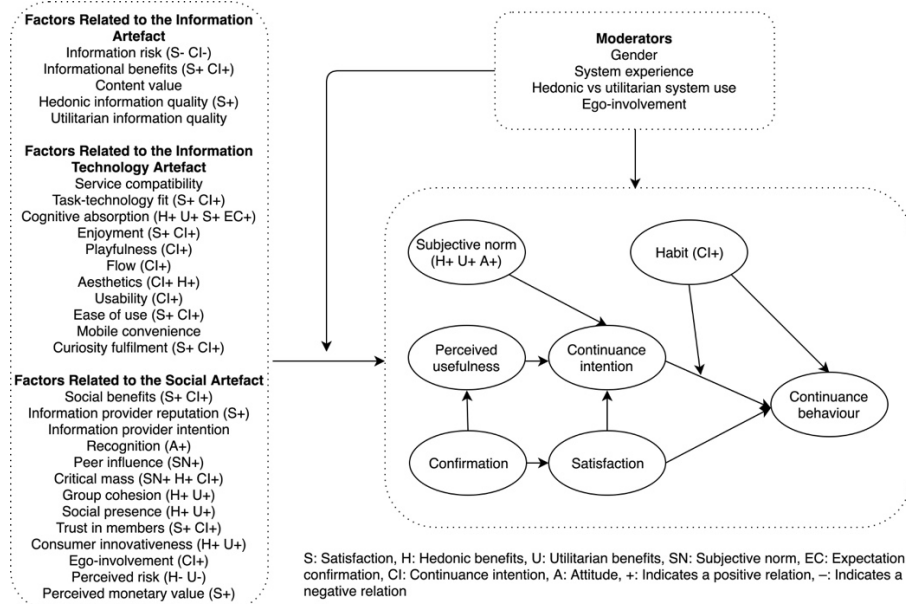


Figure 2. ECT-based model of factors affecting continued use of dual IS

The review showed that there was a wide variety of constructs that were investigated in the research models in addition to the core constructs of the given theoretical basis of TAM (i.e., the usefulness, ease of use, enjoyment, attitude and intention to use) and ECT (i.e., the usefulness, subjective norm, habit, satisfaction, confirmation and continued use intention). We grouped these extraneous constructs according to the three dimensions of IS artefacts (Iivari 2017): factors related to the information technology artifact, factors related to the information artifact and factors related to the social artifact. However, a complete taxonomical division of constructs is difficult to create because many of them are inter-related or cover overlapping concepts; yet, they differ in nuances. In these cases, we preferred to keep them as separate constructs in order not to lose any important aspects. Or, otherwise, they were named differently although

they represented the same concept. In these cases, we kept those constructs under the most common lexicon used in IS. In Figure 1 and 2, the factors that had a direct or indirect effect on the main variables of the two main theories are indicated with their effect in parentheses. However, it should be noted that the effect of all these antecedents is more complex in the original research models than in the respective research models presented in this paper. Moreover, in Figure 1, the hedonic and utilitarian benefits are shown in an aggregated manner to provide simplicity. In the reviewed literature, hedonic benefits were represented by perceived enjoyment, playfulness, cognitive absorption, flow, aesthetics and affective quality concepts. As for utilitarian benefits, they were represented by perceived usefulness, performance expectancy, utilitarian value or gratifications. The rest of the influential constructs and their effects are described in the following sections.

### ***Factors Related to the Information Artefact***

The importance of information quality as one of the major dimensions of IS success was pointed out more than 3 decades ago (DeLone and McLean 1992). With the emergence of Web 2.0 and its corollary user-generated content, this importance has only increased exponentially. Content is one of the major building blocks of social media services (Kietzmann et al. 2011), and it takes different forms in different types of systems. This prominence hasn't been overlooked with respect to dual systems neither. In the context of mobile information services, its inherent value and usefulness was found to positively affect satisfaction, particularly for users with hedonic motivation (Koivumaki et al. 2008). Also, its contextual quality such as its timeliness and relevance to users' context increased satisfaction (Koivumaki et al. 2008) and perceived ease of use and usefulness of the system; specifically, users with utilitarian goals perceived the system to be more useful when the information was relevant to their contexts (Wang et al. 2009). Furthermore, the type of content (i.e., hedonic content vs utilitarian content) (e.g., (Barelka et al. 2013; Dumlao and Ha 2013; Torres et al. 2014) was also put forward as content's important dimensions. Barelka et al. (2013) found that entertainment, informational and communication value of content affected usage of technologies particularly of those that benefited from user-generated content. For e-book readers, Torres et al. (2014) showed that hedonic and utilitarian content availability positively affected perceived playfulness and usefulness respectively. In the case of Twitter, Dumlao and Ha (2013) showed that hedonic information quality positively affected satisfaction with the system; but, utilitarian information quality increased perceived trust in members. Their study also indicated that information provider reputation and intention were influential factors for continued use of Twitter. Still, not only the content but also the feedback in the form of adequate and effective information about the internal states of the system - including those resulting from actions by the user, stands as an important factor because it influences perceived ease of use (Pianesi et al. 2009). Yet, users also hold concerns regarding how their information is used and shared by others in the network and the service provider. Hu, Kettinger and Poston (2015) showed that this kind of information risk negatively affected satisfaction with and continued use intention towards social networking services.

### ***Factors Related to the Information Technology Artefact***

A cognitive and aesthetic capture of users is becoming increasingly important with respect to interaction with IS. A captivating experience affects the enjoyment and usefulness driven from a system. Therefore, dual systems serving both hedonic and utilitarian benefits should balance this experience both with their interface characteristics and the utility they provide. The literature review showed that various interface and non-interface related aspects were studied with respect to dual systems. Among the interface related factors were flexibility in navigation, substitution of personal examination (Childers et al. 2001), image interactivity (Lee et al. 2006), perceived personalization (Pianesi et al. 2009), perceived innovativeness (Watchravesringkan et al. 2010) and interaction quality (Koivumaki et al. 2008) of the system. The non-interface related characteristics were perceived responsiveness (Chun et al. 2012), perceived ubiquitous connectivity (Chun et al. 2012), screen size (Kim and Sundar 2014) and connection quality (Koivumaki et al. 2008). All this research showed that these factors positively affected perceived ease of use, hedonic and utilitarian benefits and satisfaction with the system.

Also important here is the fit between user needs with the technology. Task-technology fit is about whether the technology characteristics meet users' needs. This fit positively affects continued use intention and satisfaction with the system (Lin 2016). A similar concept, service compatibility is the fit between users' needs and the "value-added" service; it positively affects perceived task-technology fit (Lin 2016).

### **Factors Related to the Social Artefact**

Humans are social beings and the feeling of relatedness is one of their fundamental psychological needs that exhibits itself as the sense of belonging and being connected (Deci and Ryan 2000). This feeling is also valid in the context of information systems; e.g., through provision of social connections, cooperative and comparative actions (Przybylski et al. 2010). Similarly, the literature review pointed out social presence (Etemad-Sajadi 2014; Liu et al. 2013) and relational benefits (Chen and Fu 2018; Hu et al. 2015; Zhou et al. 2014) as influential factors. Social presence, which was defined as the ability to form warm and personal connections with people through the system, was found to positively affect hedonic and utilitarian benefits in the context of virtual worlds (Liu et al. 2013) and a restaurant website that made use of a virtual agent (Etemad-Sajadi 2014). On the other hand, relational benefits stand for communicative and social networking benefits. It was found that it positively affected satisfaction with the system and continued use intention in the context of social networking services (Chen and Fu 2018; Hu et al. 2015) and social virtual worlds (Zhou et al. 2014).

Another important social factor is subjective norm. It is the perceived social pressure from important others regarding performing or not performing the behavior (Ajzen 1991). It was found to positively affect hedonic and utilitarian benefits driven from the information system (Chun et al. 2012; Ozturk et al. 2016), attitude towards using it (Hamari and Koivisto 2015a) and continued use intention (Chang et al. 2014).

In addition, the number of other users also enhances the value a user derives from a system (Katz and Shapiro 1994). Chang et al. (2014) conceptualized this as critical mass and defined it as the existence of substantial number of people using the technology. In the context of online multiplayer games, they found that it positively affected subjective norm, hedonic expectations and continued use intention.

According to Hamari and Koivisto (2015b), Lott and Lott (1965) and McCauley (1989) state that recognition may enhance group cohesion by providing a sense of acceptance, and hence increase the appeal of the group or of the group members. The literature review pointed out close concepts: positive self-image, recognition and group cohesion. Positive self-image is about the status or standing within a group. Chun et al. (2012) showed that positive self-image positively affected Korean college students' perceived enjoyment and usefulness with smartphones. Recognition, defined as the social feedback received with regards to behaviors, was shown to positively affect attitude in the context of a gamified exercise service (Hamari and Koivisto 2015a). Group cohesion, on the other hand, is the sense of belonging to a particular group: Liu et al. (2013) showed that it positively affected hedonic and utilitarian benefits in the context of the virtual world, Second Life. In addition, perceived fashionability was also put forward as an important aspect in the context of smartphones (Watchravesringkan et al. 2010). When the product/service was adopted by relatively high number of people and its certain attributes implied popularity, users perceived it as fashionable and this perception positively affected their attitude towards using the smartphone (Watchravesringkan et al. 2010).

Monetary transactions or provision of personal information is part of many dual systems such as online shopping services, hotel booking services, smartphone applications and virtual communities. A rich body of literature studied user concerns stemming from these kind of activities (e.g., (Hui et al. 2014; Malhotra et al. 2004)). Accordingly, our review showed that user concerns related to trust and perceived risk played significant roles in dual systems' use. Trust is the belief in the ability, benevolence, and integrity of the other parties involved in an activity. It was studied in the context of online shopping services (Chiu et al. 2009), virtual communities (Lee et al. 2014) and social networking services (Dumlao and Ha 2013). These studies showed that trust positively affected intention to use and continued use intention towards the subject information system. In addition, Chiu et al. (2009) showed that fulfilment, privacy, responsiveness and contact were significant antecedents of trust in the context of online shopping. He defined fulfilment as the degree to which the service accomplished its promise to the customers; privacy as the degree to which customer information was kept secure and protected; responsiveness as adequate and timely handling of problems and questions; and contact as availability of assistance through service representatives. What is more, Dumlao and Ha (2013) showed that utilitarian information quality and information provider intention also had a positive effect on perceived trust in the context of the social networking service, Twitter. They defined utilitarian information quality as the quality of the information piece to provide knowledge to users, or enable them to achieve a task or objective; and information provider intention as the altruistic and responsible behaviour of the information provider towards other users.

On the other hand, perceived risk was conceptualized as the concerns regarding possible losses (e.g., related to security, privacy or money) when a product did not perform as expected. It was studied comparatively for hedonic and utilitarian smartphone applications (Xiang et al. 2015) and in the context of mobile hotel booking services (Ozturk et al. 2016). These studies showed that perceived risk negatively affected intention to use and continued use intention. Yet, these affects were stronger for utilitarian systems (Xiang et al. 2015). Besides, it was found that perceived risk's negative effect was stronger on hedonic benefits than on utilitarian benefits (Ozturk et al. 2016).

The literature review also showed that various characteristics of users influenced their use of dual IS. Among these are demographic characteristics, personalities, skills and their motivation towards the IS use. Gender significantly affects the influence of various factors. For instance, several studies found that the effects of social, hedonic and utilitarian benefits differed between genders with respect to acceptance (Yang and Lee 2010) and continued use intentions (Chen and Fu 2018; Zhou et al. 2014).

Users' personalities were studied from various perspectives. For example, self-identity, which was defined as the conformity of the technology to the user's own enduring values and attitudes as a part of their societal role, was found to positively affect enjoyment and attitude with respect to travel related mobile applications (Young Im and Hancer 2014). Notably, experience with the technology decreased this positive effect on enjoyment; yet, it enhanced the positive effect on attitude. A close concept to self-identity was ego involvement. Sánchez-Franco and Martín-Velicia (2011) found that ego involvement positively affected commitment (in other words continued use intention), and it interacted with the effects of aesthetics and usability differently in hedonic and utilitarian websites. Another studied personality characteristics was consumer innovativeness. Ozturk et al. (2016) defined consumer innovativeness as the degree to which an individual was receptive to new ideas and made innovative decisions independently, and was willing to try out new technologies. Their study found that it positively affected utilitarian value more than hedonic, and it had an indirect positive effect on continued use intention.

Skill is another user related factor that was shown to be influential. Pianesi et al. (2009) defined it as the user's capacity for pursuing a given activity (e.g., using the system). Their study showed that in the context of adaptive mobile museum guides, skill positively affected cognitive absorption experienced with the system.

When the subject technology serves dual purposes, users may approach these systems with differing motivations. They may have a hedonic orientation and tend to seek experiential value (e.g., enjoyment) from the activity, or they may be utility-oriented and tend to seek instrumentality (e.g., time saving) from it. Lee et al. (2006) studied user motivation in the context of online shopping and found that hedonic shopping orientation positively affected enjoyment; and utilitarian shopping orientation positively affected perceived ease of use and usefulness.

Furthermore, temporal and economic factors also play an important role in adoption and continued use of dual systems. Among the temporal aspects are past experience with the technology and frequency of prior use. Past experience is previous contact with or exposure to an information system, in other words, its earlier use. In a longitudinal study with e-health newsletters, Forquer, Christensen and Tan (2014) showed that it is a stronger predictor of future use than intention. Their study also showed that perceptions of utility remained stable over time (i.e., as the experience increased) (Forquer et al. 2014). However, experience with the system has a negative effect on perceived hedonic benefits: They lose their positive effect on use intentions with experience (Barnes 2011; Forquer et al. 2014). Frequency of prior use is also an important temporal factor that causes habitual use, which positively affects continued use intention (Barnes 2011). Economic factors were represented as perceived monetary value: It is the fee of using an information system (e.g., mobile application), and it was found to positively affect satisfaction with smartphone applications in the post-adoption stage (Choi 2017).

## **Conclusion**

This paper studied the systems that were proclaimed to be multi-purpose and those concepts that were influential on their adoption and post-adoption. Through a systematic literature review, in total 35 articles were analysed with respect to their theoretical bases, research models and data analysis methods. The purpose of this review was to provide an overview of the state-of-knowledge regarding dual systems and those factors that were influential on their use. We grouped the factors we found according to the three

dimensions of IS artefacts; yet, we acknowledge that this grouping is not strict and the concepts may belong to more than one dimension. The results of this overview were synthesized into two models presented in Figure 1 and Figure 2.

The review showed that dual systems comprise more types of technologies than regarded by previous literature (e.g., (Gerow et al. 2013; Wu and Lu 2013)). The systems that were proclaimed to be multi-purpose in the review were online shopping services, virtual worlds, gamified systems, mobile devices (e.g., smart phones, tablets, e-book readers), mobile travelling services, social networking services, Internet services, online multi-player games and mobile museum guides. This result emphasizes that a unilateral perspective would be biased when designing or studying these systems, and it highlights the importance of breaking preconceptions about what makes people use a system, and the factors influential on its use.

The results of this study provide a comprehensive review of factors influential on adoption and post-adoption of dual IS. Therefore, system designers can benefit from it in identifying the factors that influence consumer perception of a multi-purpose technology in design, development and marketing stages of the system. However, designers should pay heed to the factors that are prominent for specific systems because not all factors are generalizable to other systems or use types.

As an early overview and front end of a bigger study, this research has some limitations that provide avenues for future research. First, there are limitations due to the search string used. The search string focused on adoption, post-adoption and duality in information systems. Yet, there are studies in other areas that can provide important insights about multi-purpose systems and factors affecting their use. Therefore, future research should expand the review to cover other areas using a richer set of keywords in the search string. Second, the literature review covers only those papers that explicitly recognize dual systems. Therefore, future research can expand this review to cover the articles that analyze dual systems without a claim of their multipurpose use. Finally, we were not able to apply the concepts developed in Figure 1 and 2 to different dual IS and to test the influences exemplarily, nor we were able to provide a thorough reflection of the effects of the constructs (e.g., their strength). Therefore, these steps remain as future work. Another step towards improving this work would be to provide design implications regarding the factors influential on the use of a given system or testable propositions with regards to their effects.

## Appendix

( TITLE-ABS-KEY ( "dual information system" ) OR TITLE-ABS-KEY ( "mixed information system" ) OR TITLE-ABS-KEY ( "utilitarian/hedonic" ) OR TITLE-ABS-KEY ( "hedonic/utilitarian" ) OR TITLE-ABS-KEY ( "hedonic and utilitarian" ) OR TITLE-ABS-KEY ( "hedonic or utilitarian" ) OR TITLE-ABS-KEY ( "utilitarian and hedonic" ) OR TITLE-ABS-KEY ( "utilitarian or hedonic" ) OR TITLE-ABS-KEY ( "dual-purposed" ) ) AND ( TITLE-ABS-KEY ( "technology acceptance" ) OR TITLE-ABS-KEY ( "technology adoption" ) OR TITLE-ABS-KEY ( "continued use" ) OR TITLE-ABS-KEY ( "continuance" ) OR TITLE-ABS-KEY ( "continue using" ) OR TITLE-ABS-KEY ( "discontinuance" ) OR TITLE-ABS-KEY ( "discontinued use" ) OR TITLE-ABS-KEY ( "discontinue using" ) OR TITLE-ABS-KEY ( "post-adoption" ) ) AND ( LIMIT-TO ( DOCTYPE,"ar " ) OR LIMIT-TO ( DOCTYPE," cr " ) OR LIMIT-TO ( DOCTYPE," cp " ) OR LIMIT-TO ( DOCTYPE," ch " ) )

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