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Applying Task-Technology Fit to the Adoption of Identity Management Systems

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Abstract

It has been established that if technology provides a good fit with the task, users will consider the technology to be easy to use, which will affect their intention to use. However, no studies have investigated the conceptualisation and measurement of fit in the Identity Management Systems (IdMS) context. This study conceptualises the concept of fit as moderation (the interaction between task and technology). It proposes an IdMS task model for Information Card (InfoCard) technology. In addition, it introduces a research model based on Task-Technology Fit (TTF) to identify the fit between task characteristics and the IdMS functions and to examine its effect on the user acceptance of an IdMS tool, specifically InfoCard technology. The conclusion of this paper highlights the implications of and suggests further directions for this study.

Keywords

Identity Management Systems, Information Cards, fit, task characteristics, technology characteristics

INTRODUCTION

The issue of control over how people present themselves online is a challenging technological task. Therefore, the need for effectively implemented Identity Management Systems (IdMS) is increasingly critical. Identity Management (IdM) refers to the management of user identities and the resources that each person has access to in the online world. IdMS represent solutions that are employed to manage end-user authentication, access rights and restrictions, account profiles and other attributes that provide an individual with more control over his/her identity information (Pato 2003). As digital identity becomes more and more important in the online world, the emergence of IdMS has brought about primary changes to e-transactions. Thus, researchers suggest that additional research into IdMS studies should include the interaction between users and the system (Ivy et al. 2010; Seltsikas and O'Keefe 2010).

Task and technology are crucial factors in Information Systems (IS) success and research (DeLone and McLean 1992; Seddon 1997). Since these two factors have been integrated, new technologies are able to change the nature of tasks and potentially create new tasks (Junglas et al. 2008). Fit models that reveal the gap between what technologies are able to provide and what the technologies are expected to support are critical instruments in IS. They have been successfully applied to explain and predict IS utilisation, adoption and performance (Goodhue and Thompson 1995; Junglas et al. 2008). Examining the fit of an Information Technology (IT) to a user's task is a frequent focus of Human Computer Interaction (HCI)/IS research (Dishaw and Strong 2005).

The user's intention to use the technology should come from the fit between tasks and functions (Yen et al. 2010). A method of conceptualising and measuring fit can be found in the Task-Technology Fit model (TTF). Some TTF researchers have investigated the fit conceptualisation and measurement in different contexts. A number of these studies have examined the effect of fit on performance (Goodhue and Thompson 1995), tool usage (Dishaw and Strong 2005; 1999; 1998) and intention to use (Yen et al. 2010). However, to our knowledge, no research has conceptualised and measured fit and examined its effect on users' intention to use in an IdMS context. Therefore, the current study aims to conceptualise fit and its relation to user's intention to use an identity management system tool, specifically Information Card technology.

We develop a new model for IdMS tasks to identify the fit between IdMS tasks and IdMS tools' functions. In addition, this study describes the fit between IdMS technology and tasks; and explains how they affect users' intentions to use an IdMS technology by applying a model based on the constructs of TTF (Goodhue and

Thompson 1995). TTF model has been applied and tested by researchers in different contexts (e.g. D'Ambra and Wilson 2004; Dishaw and Strong 1999; Yen et al. 2010) to examine user perceptions of IT. However, at the present time there are no empirical results related to IdMS acceptance. Thus, this study applies the TTF model to the user acceptance of IdMS.

This paper provides an analysis of the body of TTF literature that has emerged and classifies the research by fit category. In addition, this study contributes in several ways to the body of knowledge of two emerging areas: IdMS and technology acceptance. It provides a better understanding of the characteristics and capabilities of IdMS. From a technology acceptance perspective, this study helps to extend the body of knowledge of one of the most mature and explored areas of IS into the IdMS domain. In addition, it provides a theoretical user-acceptance model relevant to IdMS. From a practical perspective; it contributes to the success of IdMS for use by end-users. Moreover, as TTF provides an understanding of technology use (Cane and McCarthy 2009), the proposed model could identify some technical areas needing further investigation.

This study aims to answers the following questions:

(1) What factors affect user acceptance of an IdMS tool from the user's perspective?
(2) How can the nature of IdMS tasks be modelled?
(3) How can the interaction between IdMS tasks and functions (fit) affect user acceptance of an IdMS tool?

The remainder of the paper is organised as follows. First, this paper defines and provides an overview of Identity Management Systems and InfoCard technology. Second, we identify the concept of fit in IS and TTF research. Third, we introduce and clarify the task model for this study based on TTF theory. The paper's conclusion highlights the implications of and future research directions for the proposed study.

LITERATURE REVIEW

Identity Management Systems

Authentication and Identification are basic processes of business procedures, technologies and policies that enable organisations to control and manage their users' access to critical online applications whilst protecting personal business information from unauthorised users (Todorov 2007). Identification and Authentication encompass part of identity management, and are implemented through IdMS (Todorov 2007). IdMS build upon identity management to start Authentication and Identification processes before access to a particular resource is provided (Rossudowski et al. 2010). A definition of IdM was given as the framework and system used in computer or communication systems to control identity (Dabrowski and Pacyna 2008).

The concept of IdMS is confusing, because the different stakeholders concerned (users, service providers) have different requirements and views. IdMS are defined as the integration of important personal information from multiple systems into one collaborative and unique identity (WP3 2009). Further, Lee (2003) defines IdMS as the process of using emerging technologies to manage information about the identity of users and control access to business resources. The goal of IdMS is to develop productivity and security, whereas lowering costs relates to managing users and their identities' credentials as well as attributes.

The IdMS are based upon a set of principles called the "Laws of Identity" (Cameron, 2005). The laws were proposed, debated, and distinguished through a long running, open, and continuing dialogue on the Internet. They have been widely acknowledged both in academia and in practice. These seven essential laws explain the successes and failures of digital identity systems. They are: User Control and Consent, Minimal Disclosure for a Constrained Use, Justifiable Parties, Directed Identity, Pluralism of Operators and Technologies, Human Integration and Consistent Experience across Contexts (Cameron 2005).

Information Card (InfoCard)

Information Cards (or InfoCards) are digital IdMS tools that have recently been adopted by Microsoft (Alrodhan and Mitchell 2009). InfoCards offer a user interface (UI) that enables the user to create, manage and work with various digital identities. InfoCards provide a reliable UI whereby users can securely access their identities during commercial transactions. Identity Selector is one of the core components of the InfoCard; this enables the user to make decisions about his/her digital identities (WP3 et al. 2009).

The digital identities in InfoCards are characterised as claims made by one digital subject (e.g., the user) about itself or another digital subject. A claim is a declaration that certain identifying information relates to a given digital subject (e.g., names, credit card number, etc.) (Cameron and Jones 2007). Thus, user identifiers (e.g., a username) and user attributes (e.g., user gender) are both treated as claims within the identity metasystem (Alrodhan and Mitchell 2009). There are three various parties which are relevant to the architecture of InfoCards:

1. The *user*, who holds several Information Cards which contain several pieces of identity information about him/her.
2. *Relying parties or service providers*, e.g., websites, services or companies that request and accept the Information Cards as a security token.
3. *Identity providers* who assert that the Information Cards are security tokens for the user (WP3 2009, p. 25).

There are two types of InfoCard: first, personal cards contain the user's personal information, which is encrypted, and can be sent to the relying party at the user's permission; second, managed cards which contain such information as credit card information, and this is maintained in the data systems of the identity provider (Rossudowski 2010; WP3 et al. 2009).

InfoCards have been selected for this study as IdMS tools for the following reasons. First, InfoCards have some features and functions similar to those of other IdMS (Alrodhan and Mitchell 2009; Al-Sinani et al. 2010; Maler and Reed 2008) and they differ slightly from those initiatives developed for the Internet (Alrodhan and Mitchell 2009; Rossudowski et al. 2010). This means that the developments and expected results of this study are applicable to IdMS in general. Second, InfoCards are regarded as a user-controlled system, as the identity stored in the user's device and the user decides if an identity will be used, along with which identity will be used. Such a system could provide full understanding of end-user behaviour, as the user has complete control over the system compared with other IdMS. Thirdly, InfoCards are still in their inception, and their adoption rate is limited (Valkenburg et al. 2010). Thus, we believe that understanding factors that affect the adoption behaviour related to InfoCards is very important, as this can increase user adoption and provide insights on this issue. Finally, InfoCards have a potential impact on the marketplace (Valkenburg et al. 2010).

Task Technology Fit

TTF is the extent to which a technology aids an individual to be accepted if the functions of the technology (fit) correspond with the tasks that must be performed (Cane and McCarthy 2009). A system function supports an activity if it facilitates that activity (Dishaw et al. 2004). Hence, technology will only be accepted by individuals if its functions correspond with the tasks to be carried out. TTF was developed by Goodhue and Thompson (1995) in order to gain an understanding concerning the link between individual perception and information systems. It is a combination of two systems of research streams: the TTF focus and the utilisation focus (Cane and McCarthy 2009). Thus, users should suppose that any given characteristic of a technology will have diverse effects on acceptance, use and performance depending upon the type of user or the task requirements (Goodhue et al. 2000).

The extant literature indicates that there many studies have examined and measured TTF constructs in different contexts, such as Computer-Based Information Systems (CBIS) (e.g. Ferrat and Vlahos 1998; Vlahos et al. 2004), Unified Modeling Language (UML) (e.g. Grossman et al. 2004), Personal Digital Assistants (PDAs) (e.g. Lee et al. 2007), Mobile Information System (e.g. Gebauer et al. 2010), Web Services (e.g. D'Ambra and Wilson 2004) and Enterprise Resource Planning (ERP) (e.g. Kositanurit et al. 2007). To the best of our knowledge, the idea of TTF has not been considered for IdMS before, and has not been assessed to achieve fit for particular combinations of tasks and technology.

The system and technological levels are principally focused on the technology itself (Cho 2006). IdMS application would be associated with products or services that assist people to do their daily tasks. Therefore, IdMS is regarded as a tool to control communication in addition to performing complicated tasks such as managing and controlling online identity. Consequently, the adoption and use of IdMS may be perceived as difficult, and generally, TTF should be considered. Researchers suggested that studies on new technology adoption should include an examination of its compatibility with the normal style (Cho 2006). Besides, the extent to which the technology itself can be adopted determines the success of a change. An investigation using the TTF model provides an understanding of the hypothesis involved in comprehending technology use and clarifies technical areas needing future examination (Cane and McCarthy 2009).

DEFINING AND MEASURING FIT IN IS/TTF RESEARCH

Venkatraman (1989) proposed a conceptual framework derived from the concept of fit. Fit is identified in six different perspectives for its conceptualisation: fit as moderation, fit as mediation, fit as matching, fit as gestalts, fit as profile deviation and fit as covariation (Venkatraman 1989; see Table 1). Fit as moderation, mediation and matching identify a relationship between just two variables, whereas fit as gestalts, profile deviation and covariation identify a relationship between many variables. While these six perspectives are described in the context of strategy research, they apply equally well to the HCI/IS research focusing on the fit between IT and tasks (Dishaw and Strong 2005).

Measuring fit can be found in the task-technology fit model. TTF is defined as the degree to which the functionality of a technology matches the task and the abilities of the individual who performs the task (Goodhue and Thompson 1995). In this study, we decouple fit from current utilisation and the operationalisation of TTF is defined as "*the degree to which a technology does or could meet your task needs*" (Goodhue et al. 1997, p.458). IS/TTF research has examined methods for conceptualising and measuring the TTF to which a particular IT fits a particular task (see Table 1). However, a number of researchers have pointed out that there has been a lack of distinction between the conceptual understanding of fit and its measuring schemes (Junglas et al. 2008; Venkatraman 1989). To the best of our knowledge, no study has yet conceptualised or measured the fit concept in the Identity Management context.

Junglas and Waston (2003) noted that there is limited process in defining and measuring fit. They defined fit as ideal, under or over; this reveals the ideal mappings of task needs and technology functionality in the context of ubiquitous commerce (u-commerce). Junglas and Waston identified three dimensions for task characteristics—time dependency, location dependency and identity dependency—and four dimensions for the technology characteristics of u-commerce, specifically ubiquity, uniqueness, universality and unison. Junglas et al. (2008) tested how various fit levels affect individual performance across different tasks performed with mobile locatable information systems. They examined efficiency and effectiveness with regards to diverse levels of technology fit and with regards to different kinds of tasks. The results of a wireless laboratory experiment with 112 subjects showed that subjects perceive differences between under and ideal, as well as under and over, fit conditions when exposed to tasks that include localisation components.

Table 1.Fit conceptualisation used in TTF research

Fit perspective	Definition	Reference	Context
Fit as moderation	"is based on contingency perspective that operationalizes fit as a statistically derived interaction relationship between two variables that predicts the third"(Cane and McCarthy, 2009, p.108)	Goodhue and Thompson (1995);Goodhue (1995) Dishaw and Strong (1998;1999;2003) Strong et al. 2006	Computer System Software Maintenance Tool
Fit as matching	"a theoretically defined match between two related variables" (Venkatraman,1989, p. 430)	Nance and Straub (1996) Dishaw et al. (2004) Junglas et al. (2008)	Knowledge Work Software Maintenance Tool Mobile locatable IS
Fit as profile-deviation	"the degree of adherence to an externally specified profile" (Venkatraman,1989, p. 433)	Dennis et al. (2001); Murphy and Kerr (2000);Zigrus and Buckland (1998) ; Zigrus et al. (1999) Junglas et al. (2008) Gebauer (2010)	Group Support Systems(GSS) Mobile Locatable IS Mobile IS
Fit as gestalts	"is a multivariate perspective to fit as opposed to fit as moderation, mediation and matching, which are based on a bivariate fit approach" (Cane and McCarthy 2009, p.108)	Benslimane et al. (2002)	WWW /E-commerce
Fit as mediation	"statistically derived as the mediating mechanism and there can be two or more variables in the specification of fit" (Cane and McCarthy 2009,p.108)	NA	NA

Fit as covariation	"a pattern of covariation or internal consistency among a set of underlying theoretically related variables" (Venkatraman 1989, p. 435)	Klopping and McKinney (2004) Ferrat and Vlahos (1998) D'Ambra and Wilson (2004)	E-commerce Computer Based Information Systems (CBIS) Web

Conceptualising the Fit (Fit as Moderation)

Venkatraman (1989) has argued that researchers should "*justify their specification of fit within a particular research context*" (p. 439), as each conceptualisation of fit has implications for the analytical techniques used to test the relationships. Therefore, this study views fit as moderation (interaction). Fit as moderation is a common conceptualisation in the HCI/IS literature. In this perspective, IT is a moderator that impacts the resulting outcome measure (performance of a task or utilisation of the technology) (Dishaw and Strong 2005). Fit as moderation has two direct effects and an interaction effect (Venkatraman 1989). The statistical model includes task and technology main effects and an interaction effect between task and technology, each of which directly impacts an outcome variable (see Figure 1).

Goodhue and Thompson (1995) used the fit as moderation approach and developed an original instrument to test the TTF construct including eight dimensions: the quality of data, locatability of data, authorisation, data compatibility, training and ease of use, production timeliness, systems reliability and the Information System's relationship with users. This instrument was later refined and validated to a 12-dimensional construct (Goodhue 1998), without considering available IT functionality or tasks needed. Goodhue et al. (2000) also proposed 11 items for the exploration of information integration. These included consistency, educational training, helpfulness of system, reliability of system, accessibility of information, meaningfulness of information, right data, ease of use of system, understandability, familiarity with a database system and familiarity with programming; these are all used as a starting point. Researchers reveal that as a new combination of task and technology occurs, new measurement items must be developed (Dishaw and Strong 1998). This makes the applicability of the instrument too specific, and raises the concern of validity across contexts (Junglas et al. 2008). Hence, the operationalisation of TTF model in a specific context is difficult as the task and technology must be specified (Dishaw and Strong 2005). Table 2 presents the operationalisation of TTF model in this study.

Dishaw and Strong (1998) used the fit as moderation conceptualisation in the context of software maintenance support tools. They developed TTF as a computed match between available IT functionality and the functionality needed to complete multiple tasks. Their model involved two dimensions of fit: production fit and coordination fit. The first model included production functionality in the technology, characteristics of production tasks and production fit, which is the interaction of production technology with production tasks. The other model is similar, but focuses on coordination functionality, coordination tasks and coordination fit.

Dishaw and Strong have continued using the fit as moderation concept; they have explored the addition of other explanatory variables to TTF models, but focused on the single dimension of production fit. They examined the addition of Technology Acceptance Model (TAM) variables to TTF (Dishaw and Strong 1999), task and tool experience variables (Dishaw and Strong 2003) and self-efficacy (Strong et al. 2006).

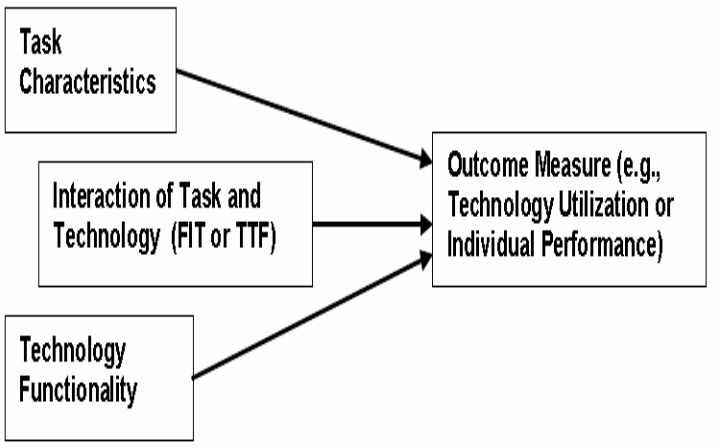

Figure 1: Statistical Model for Task-Technology Fit as Moderation (Source: Dishaw and Strong, 2005)

Table 2. Operationalising the TTF Model

TTF	Definition	Operationalization
Goodhue and Thompson (1995)	"the degree to which a technology assists an individual in performing his or her portfolio of tasks'' (p.216).	TTF as user evaluation which is predicted by the interactions.
Dishaw and Strong (1998)	"the matching of functional capability of available software with the activity demands of the task" (p.109).	TTF as computed interaction which predicts utilization.

RESEARCH MODEL

The research model intends to identify the fit between IdMS tasks and technologies' functions by drawing on the TTF model (see Figure 2). The IdMS task includes five dimensions: access, control, creation management, choice of digital identities and mobility. IdMS functions are: minimal disclosure, human interaction, consistent user experience, mutual authentication, alteration and deletion and data rejection. Intention to use is the dependent variable in the proposed model, which is defined as "a user's intent to use a particular IdMS such as InfoCards". Behavioural intention is very important as a determinant of the user's acceptance of technology (Legris et al. 2003; Moon and Kim 2001). Intention to use is more appropriate, as IdMS are still at an early stage of development in many places. In order to identify the best fit, we need to understand the nature of IdMS, and specifically the nature of InfoCards functions.

Identity Management System Task Characteristics

Tasks are defined as a set of actions carried out by individuals to run inputs into outputs in order to satisfy their needs (Goodhue and Thompson 1995). Task characteristics are those tasks where a user might employ IT in order to perform them. Drawing from the TTF perspective; task-fit is defined as the user's perception of the suitability of a particular IdMS tool to support a particular task. IdMS tasks include various transactions (financial or non-financial) which a user may wish to conduct with his /her digital identity. Based on the identity management and IS literature, IdMS tasks can be identified in five activities: access, control, creation management, choice and mobility. These characteristics can affect usage and users' perceptions of the technology. In addition, the characteristics of the task can impact the fit between task and technology.

Access, control, creation management: IdMS used in computers or communication to access specific services and control management identity. The principle of designing IdMS is to put users into the middle of transactions between identity providers and relying parties as a user-centric IdM paradigm. This paradigm moves the control of digital identities from Service Providers (SPs) to the users. By doing so, users can decide which identities are required to be shared with other trusted parties and under which circumstances (Cao and Yang 2010). IdMS integrate many technologies employed in user's Identity Management and resource access control. InfoCards provide creation, maintenance and deletion of user identities; this represents the lifecycle of identity. Moreover, the user can create his/her own InfoCards.

Choice: From the InfoCards view, the user can issue his/her own self-constructed identity cards. The Identity Selector is one of the core components of InfoCards; this enables the user to make decisions about her/his digital identities. In that regard, the user can choose which identity will be used to log on for a service (WP3 2009). However, when an SP needs an identity that is assigned by an Identity Provider (IdP), the amount of identity choices will be limited depending on the requirements of the SP, and the number of IdPs that can meet these requirements.

Mobility: This refers to "*the capability of an information processing device to determine its geographic position*" (Junglas et al. 2008, p. 1047). Mobility is one of fundamental characteristics of IdMS and one of the user requirements that IdMS supports (Cao and Yang 2010). Mobility is defined here as the geographic range of location (locatability) where users can access and use their digital identities. Users can access, control and manage their digital identity from anywhere, and at any time, with complete freedom. From the InfoCard perspective, a user can export and transfer the InfoCards from one PC to another using its backup facilities (Al-Sinani and Mitchell 2010). Moreover, the InfoCards interface has some help functions and click-through options that consistently represent folders and documents.

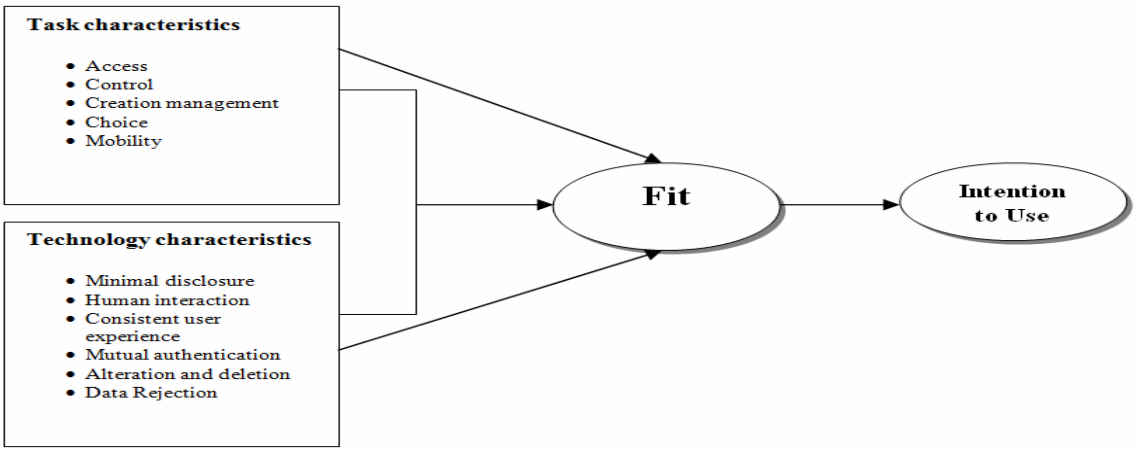

Figure 2: Identity Management System: InfoCard Task Model

Identity Managements Systems' Technology Characteristics

Technology characteristics describe the tools, and include whether the IT is a single system or a set of systems, policies or services (Goodhue and Thompson 1995). Technology characteristics refer to the technology used by individuals in carrying their tasks. TTF research has frequently characterised IT based on functionality (Gebauer et al. 2010). IdMS, including InfoCards, are designed to meet the "Laws of Identity", which were developed by Kim Cameron. These identity laws define how to successfully extend the Internet with an identity management layer (Bertocci et al. 2007). In this study, we focused on functions that are significantly related to the design dimensions of IdMS. Thus, most of these laws represent InfoCard technology characteristics. In addition, they have provided a foundation for the usability and adoption features of InfoCards (WP3 2009). Thus, we identify technology characteristics in six dimensions, three based on the laws of identity—minimal disclosure of information, human interaction, user experience—and three identified from IdMS functions based on the literature—mutual authentication, alteration and deletion and data rejection. We propose that the characteristics of the technology used to perform tasks can impact the fit between task and technology.

Minimal disclosure: This is the ability to disclose the least amount of identifying information and limit its use (Cameron 2005).Cameron (2005) states that "*aggregation of identifying information also aggregates risk. To minimize risk, minimize aggregation*" (p.7). The Identity Selector of the InfoCard allows a user to create a personal card with self-asserted claims. InfoCards restrict the contents of personal cards to non-sensitive data, such as that published in telephone directories. Personal cards at this time only support 14 editable claim types, such as First Name, Last Name, Email Address, Street, City, State, Postal Code, Country/Region, etc. (Al-Sinani et al. 2010). A set of personal data inserted in personal cards is stored in encrypted form on the user machine (security token).

Human interaction: This defines "*the human user to be a component of the distributed system integrated through unambiguous human-machine communication mechanisms offering protection against identity attacks*" (Cameron 2005, p. 10). InfoCards enable identities to be used within systems based on different technologies. For example, InfoCards aim to manage identities at the end-users' machine. They are implemented in the Vista operating system and can be used for multiple other operating systems; furthermore, they can be integrated with different browsers.

***Consistent user experience*:** The InfoCards interface aims to provide a consistent user experience for the management of digital identities. It provides the user with an overview of the site information and the certificate that has been issued to the service provider (WP3 2009). Moreover, the user can create, select and delete his/her own InfoCards, providing the end-users with a simple and consistent experience of handling their identities over a number of contextual identity choices.

Mutual authentication: This is not just user authentication; rather, it provides assurance as to the identities of both participants (the user and the service providers). From the InfoCards perspective, users have to authenticate to websites, and websites should authenticate themselves to the user (WP3 2009). This ensures that users are not providing their information to a phishing site, thereby enhancing the system's trustworthiness.

Alteration and deletion: This is the ability to delete and alter an identity. Identities created by the users can be deleted and altered via the InfoCards interface.

Data rejection: This means remembering what information the user has released to a given site, and resupplying that same information to the site whenever it requests it (Cameron and Jones 2007). Data rejection's main benefit

is that information that is not retained cannot be used for data breaches for which a site can be held accountable. InfoCards facilitate "Data rejection", since the Identity Selector in the interface can remember which identity has been used for a site (Cameron and Jones 2007).

Fit

This study adopts Goodhue and Thompson (1995) and Dishaw and Strong's (1998) definitions of TTF: operationalising fit as a statistically derived interaction relationship between two variables that predicts the third (see Figure 2 and Table 1). This means that IT will be used if, and only if, the functions available to the user support (fit) the activities of the user (Dishaw and Strong 1999). This study adapts Venkatraman's (1989) perspective of fit as moderation, which assesses the moderation effect as a direct impact and an interaction. Here, the operationalisation of TTF is the interaction of the task and technology characteristics of InfoCards.

The user's intention to employ IT should also come from the fit between technology and task (Yen et al. 2010). At the individual level, a "system/work fit" construct has been found to be a good predictor of IT use (Goodhue and Thompson 1995). IdMS is not users' primary focus; users are more focused in their online identity tasks (Dhamija and Dusseault 2008). Users want many of the benefits that well-designed IdMS provide, such as increased security or privacy. However, users have proven that they are unwilling to spend money or time in security improvements (Acquisti and Grossklags 2005). Users tend to seek immediate benefits and features that save time or may reduce risks. Therefore, the immediate and more obvious benefits are more likely to impact user adoption (Acquisti and Grossklags 2005; Dhamija and Dusseault 2008).This indicates the fact that users will have higher intention to use IdMS if the IdMS technologies and services support the task that the users are dealing with their online identities. Therefore, we propose that the fit between task and technology characteristics affect the users' intention to use InfoCards.

CONCLOUSION AND FUTURE DIRECTIONS

The current study proposed a task model for IdMS, specifically Information Card technology based on the TTF model. Such a model has not been suggested in past literature in the IdMS context. It identified the fit between task and technology characteristics and how the interaction between them affect user acceptance of InfoCards. We suggested that the interaction of task and technology characteristics (fit) has a positive effect on users' intention to use InfoCards. Because the proposed task model is grounded in general IdMS tasks and functions, as well as the laws of identity, which most IdMS's designs are based on, it is appropriate for more IdMS tools, not just InfoCards. However, the fit between task and technology may be different when specific kinds of technology or tasks are considered. The expected results can offer guidance on how to increase the adoption rates and open new avenues for research in the area of IdMS.

Two directions were suggested for future research in this study. First, the proposed model will be combined with the Technology Acceptance Model (TAM) to understand the determinants of users' intention to adopt IdMS technologies. The integrated model confirmed that users' beliefs regarding ease of use and usefulness are influenced by characteristics of technology and task (Dishaw and Strong, 1999). It has been suggested that these two incomplete models (TTF and TAM) are not isolated, but rather combined models interacting together. Many researchers have suggested that TTF needs to be extended and integrated with TAM or vice versa to strengthen the ability to understand and explain IS use (Bagozzi 2007; Cane and McCarthy 2009; Dishaw and Strong 1999; Goodhue 1995; Legris et al. 2003). Moreover, Dishaw and Strong (1999) revealed that the integrated model from both TAM and TTF "*provides more explanatory power than either model alone*" (p. 9). Furthermore, this model will be integrated with other external variables such as trust, security and privacy concerns to better understand and investigate user intention to use IdMS applications, as these variables have frequently been mentioned to be pertinent to the IdMS context.

Second, we plan to develop the hypothesis in the complemented model. The model will be tested by collecting data through a survey to validate the framework. Before beginning the survey, appropriate scales will be developed for the study variables given that some variables in the model were new and some item scales will be adapted from previous studies. Factor analysis will be performed to evaluate dimensionality and discriminant validity. The model will be tested using Partial Least Squares (PLS).

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