Web personalization for user acceptance of technology: An empirical investigation of E-government services

**Vinodh Krishnaraju · Saji K Mathew ·
Vijayan Sugumaran**

Abstract E-Commerce firms have adopted Web Personalization techniques extensively in the form of recommender systems for influencing user behavior for customer retention. Although there are numerous studies in this area, academic research addressing the role of Web Personalization in user acceptance of technology is very scant. Further, owing to the potential of recommender systems to attract and retain customers, most studies in web personalization have been done in E-Commerce setting. In this research, the 'Consumer Acceptance and Use of Information Technology' theory proposed in previous research has been extended to include web personalization as a moderator and has been tested in an E-Government context. Data collection involved conducting a laboratory experiment with the treatment group receiving personalized web forms for requesting an E-Government service. Our analyses show that personalizing the Web by self-reference and content relevance has a significant moderator role in influencing the relationship between determinants of intention to use and behavioral intention in certain cases.

V. Krishnaraju · S. K. Mathew
Department of Management Studies, Indian Institute of Technology
Madras, Chennai, TN 600 036, India

V. Krishnaraju
e-mail: vinodh.krishnaraju@gmail.com

S. K. Mathew
e-mail: saji@iitm.ac.in

V. Sugumaran (✉)
Department of Decision and Information Sciences, School of
Business Administration, Oakland University, Rochester, MI 48309,
USA
e-mail: sugumara@oakland.edu

1 Introduction

Personalization of products and services has gained much importance today. Instead of addressing the needs of a group, several successful firms have recently moved towards targeting segments of size one, a business strategy known as personalization (Prahlad and Krishnan 2008). Personalization requires user preferences to be known to the seller in order to recommend relevant products and services. Internet commerce, particularly B-C E-commerce opened up an electronic channel of communication between the buyer and the seller, leading to the generation of huge volumes of digital data about customer behavior. Armed with the availability of computing power, web mining algorithms evolved to power recommender systems where recommendation of products and content were given to a user based on the user's previous behavior on the web (Adomavicius and Tuzhilin 2011). Web mining thus enabled web personalization.

Web personalization is defined as any action that makes web experience of a user personalized to the user's taste (Mobasher et al. 2000). In contrast to mass customization, web personalization involves individual preferences rather than a group's interests, and is 'firm initiated' as against customization which is 'customer initiated' (Arora et al. 2008). In web personalization the content and navigation are personalized to each user based on their browsing behavior and other demographic data related to user (Mobasher et al. 2000). It might be simple advertisements, product suggestions or complete personalization where entire content over the website varies from user to user. This is particularly important in E-

Commerce where business models are based on Internet as its backbone (Schafer et al. 1999). Several successful firms engaged in E-Commerce harness technology for improving their business. Consequently, consumer acceptance of electronic platforms for buying and selling of products and services has been an area of focused research attention.

Research in the area of web mining and web personalization has received focused attention in the context of E-Commerce due to the commercial potential of enhancing it. Applications of web personalization concentrated on customizing products or services for maximizing user satisfaction have been found to deliver better results over non-personalization (Tam and Ho 2006). Although Internet commerce and its wide adoption resulted in academic attention on recommendation systems, web personalization and user acceptance of technology, research on these topics outside of E-Commerce has been very scarce. In particular, the use of web personalization comparatively in applications such as e-Government and non-profit organizational context needs due attention (Carter and Weerakkody 2008; Mirchandani et al. 2008).

Several Governments have initiated key reforms in governance using electronic channels (Rana et al. 2013, 2014). Some studies related to e-Government have suggested that impacts associated with e-Government projects are largely the result of choices made by the human agency in a social context and the features of technology plays a lesser role (Heeks and Bailur 2007; Hind et al. 2014). It appears that user acceptance of information technology in the delivery of Government services could follow a distinct pattern as compared to e-Commerce which is driven by profit motivation (Zakaria 2013; Maigre et al. 2013). There is large scope for analysing Government portals based on the need for spread of information by fast and reliable communication to large and diverse number of people (Krishnaraju and Mathew 2013; Hamner et al. 2012). However studies on the role of web personalization and its role in intention to use web based delivery of Government services have not received due attention in academic research (Weerakkody et al. 2013; Gao et al. 2010)

Technology acceptance studies have provided understanding about the adoption pattern of new technology by users (Taylor and Todd 1995). The cost involved in adoption and direct benefits were studied by researchers to justify the use of technology. These studies are important in organizational context since before release of any new technology, it is essential to understand the perception of general audience (Davis 1989). Technology acceptance theories try to explain the determinants of user's intention to use. Drawing on the foundations of cognitive psychology, the Technology Acceptance Model (TAM) proposed by Davis (1989) and the subsequent models study user behavior with respect to new technology innovations. This research seeks to extend a recent theory in technology acceptance: 'Consumer Acceptance and use of

Information Technology' also known as UTAUT2 (Venkatesh et al. 2012) by including web personalization as a new dimension. This research also draws from previous studies that integrated social cognition and consumer research decision behavior in information systems literature. We bring out the effect of web personalization in acting as a moderator in existing theory and study the importance of web personalization in technology acceptance in the domain of E-Government. In other words, this study focuses on the phenomenon of user acceptance of information technology in E-Government domain (Silcock 2001) and seeks to understand how personalizing the web could impact the intention to use technology for availing an E- Government service.

2 Literature review

2.1 Web personalization research

Web Personalization has been an integrative area of research covering concepts from Computer Science, Human Computer Interface (HCI), Marketing and Information Systems (IS). Algorithms serve as the engines for processing data, which provide the basis for web personalization. For example, Computer algorithms assist the implementation and scalability of web personalization on web sites (Stevens et al. 2003; Han and Li 2010). Further, modern data handling for web and parallel data processing of Internet usage data are useful for web usage understanding (Mobasher et al. 2000; Li and Liu 2012). Human Computer Interface in web personalization is related to user modeling of systems based on user behavior. A related technology is adaptive hypermedia which also deals with personalizing web technology to users (Kobsa 2001; Zhao et al. 2013). Marketing research draws from this area for customer oriented services based on customer behavior (Peterson et al. 1997). It deals with understanding the customer and providing targeted offers or services. Information Systems Research in relation to web personalization deals with user cognition of Information provided (Tam and Ho 2006; Dombeu and Huisman 2011).

Some recent research on web personalization from the IS perspective has derived conceptual elements from cognitive psychology and provides understanding on how user decisions are influenced by web stimulus (Tam and Ho 2006; Vo and Lai 2014; Sinha et al. 2015). There has been relatively less attention on technology acceptance of web based products to understand the role of web personalization in user behavior. There are some studies trying to bring out the dissemination of information over Internet (Hsu 2013; Liang et al. 2012; Dombeu and Huisman 2013). The cognition behavior of people changes when the format of web content provided to users changes (Jiang 2007). The perception of the user in understanding the details provided over Internet is directly affected

by web personalization. Some findings suggest that users tend to give more attention to online animations (Hong et al. 2004). Also self-reference made by websites tend to capture the attention of users and makes them more responsive. Presentation formats have been found to impact user behavior when the use of video formats is high (Jiang 2007). Content relevance and navigational content are also important aspects of web personalization that could help users in carrying out their tasks (Tam and Ho 2006)

2.2 Technology acceptance

Technology acceptance studies began when organizations tried to understand the impact of technology in workplace environment (Davis 1989). Theory of reasoned action (TRA) was one of the early models explaining the factors affecting the intention to use behavior of a person (Fishbein and Ajzen 1975). Attitude and subjective norm were proposed as determinants affecting the intention of a person. Intention of a person was expected to affect the behavior of a person in long term. Theory of Planned Behavior (TPB) was subsequently introduced by Ajzen (1991). TPB suggested perceived behavior control as another antecedent in the existing model of TRA. Technology Acceptance Model (TAM) is another highly cited model (Davis 1989), which introduced perceived usefulness and perceived ease of use as the main determinants affecting the intention to use a system. Venkatesh et al. (2003) tried to integrate eight such highly influential theories and proposed the Unified Theory of Acceptance and Use of Technology (UTAUT). They proposed four antecedents and three moderators affecting the behavioral intention to use a system leading in turn to the actual usage of the system. Most of these studies were done from an organizational perspective. Venkatesh et al. (2012) later extended UTAUT to Consumer Acceptance and Use of Information Technology (UTAUT2) to study technology acceptance from a consumer perspective. Consumer acceptance of technology is vital as most companies consider consumer usage of technology as important to business.

In UTAUT2 Venkatesh et al. (2012) proposed seven antecedents affecting consumers' intention to use a technology: Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Price and Habit. Age, Experience and Voluntariness were proposed as moderators in the above model. Performance expectancy is the degree to which an individual believes that using the technology will help him or her to attain gains in job performance. From a consumer oriented perspective, it is related to task oriented performance improvement wherein an individual expects that his or her individual performance would improve by using the technology. Effort expectancy is the degree of ease associated with the use of the technology. Social influence is related to the effect of peer thoughts and activities on the behavior of a

person. It is the degree to which an individual perceives that others who are important believe he or she should use the technology. Facilitating conditions is the belief of an individual that the necessary resources to use the technology would be available. The presence of facilitating conditions will impact the user's behavioral intention to use the technology. Hedonic motivation represents the fun and pleasure derived from using the technology. It is characterized by novelty and innovativeness of a technology. The consumer's intention to use a technology is influenced by the monetary cost associated in using the system. In a consumer setting, the user has to bear the expenses as against an organizational setting. Consumers consider the difference between perceived benefits from the system and the total costs involved in using the system in their decision making process. Habit has been conceptualized as the degree to which users tend to behave automatically based on learning. A related concept here is experience which reflects the passage of time from the point of initial use of the technology. The empirical testing of the theory by Venkatesh et al. (2012) showed that all the seven constructs significantly impacted the behavioral intention to use a technology.

2.3 Web personalization for e-government

The use and impact of information and communication technologies in business and Government organizations have significantly changed over the last few decades (Willcocks et al. 2006). E-Government systems are intended to provide fast and easy access to Government information, enable open Government, people's right to know, transparency and responsiveness (Yildiz 2007). Improving managerial effectiveness through Government process automation used to be the major role of technology in Government organizations until the widespread diffusion of personal computers and the introduction of the Internet. Technology adoption for E-Government has grown significantly with the Internet, particularly in developed countries and ICT has been considered as a strategic resource (Yildiz 2007; Sheng and Lingling 2011). Impacts associated with the use of technology in Government has been viewed from two perspectives – technological determinism where the features of a given technology drives its usage and social determinism where choices made within social structures determine the impact of a technology (Heeks and Bailur 2007). Some studies have suggested that impacts associated with E-Government are largely the result of choices made by the human agency in a social context and the features of technology plays a lesser role (Heeks and Bailur 2007).

In summary, our survey of the existing literature shows that web personalization and technology acceptance have been studied independently in various research streams. However the role of web personalization in user acceptance of technology has not received due research attention. This study

Fig. 1 Proposed Research Model
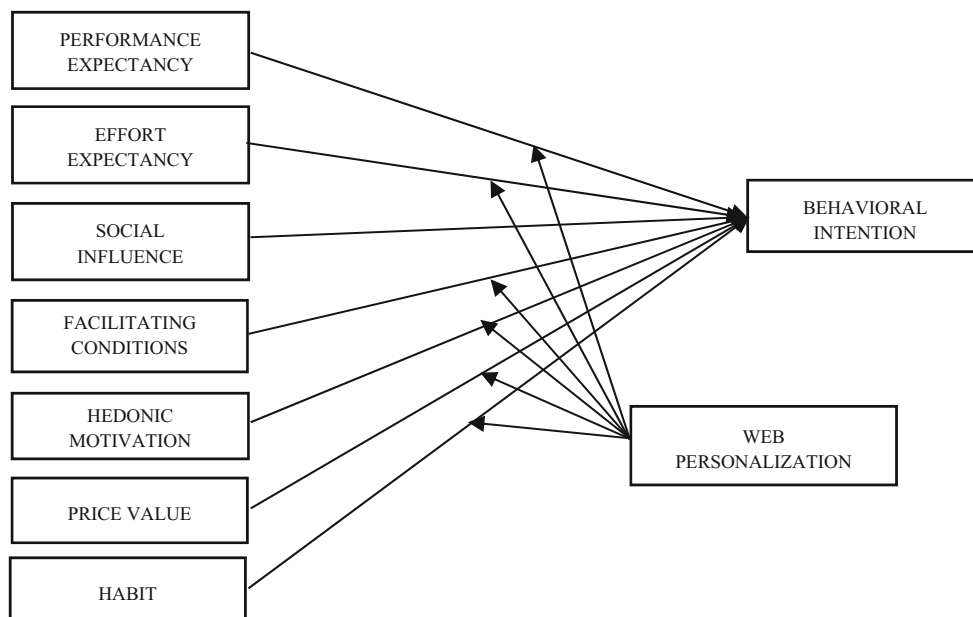
addresses this gap by empirically investigating web personalization as an influencing factor in a consumer's intention to use web based services. Our study focuses on the phenomenon of behavioral intention to use information technology in E-Government domain and seeks to understand how personalizing the web could impact intention to use technology for availing a Government service.

3 Research model and hypotheses development

We expect that web personalization will have a significant influence in the behavioral intention to use web based services targeting consumers. Although some early studies have reported that customers prefer customizable interfaces over personalization (Nunes and Kambil 2001), several studies in E-commerce setting has shown that the presence of personalized content has the potential to increase customer satisfaction (Arora et al. 2008). Drawing on cognitive psychology, Komiak and Benbasat (2006) showed that perceived personalization significantly increases customers' intention to adopt by increasing cognitive trust and emotional trust. Based on theories related to social cognition and consumer decision behavior, Tam and Ho (2006) reported that web personalization captured in essence by the two variables, content relevance and self-relevance, affects the attention, cognitive process and decisions of web users in various ways. Based on these findings we posit that the presence of web personalization will significantly moderate the impact of the determinants of user acceptance of technology on behavioral intention to use. Following Tam and Ho (2006), we conceptualize web

personalization as a construct consisting of three elements: Self reference, Content relevance and Navigational content.

3.1 Self-reference

Self-reference in web personalization refers to personalized web content associated with the self or past episode experience of the user (Tam and Ho 2006). Self-reference has been found to be an important stimulus in affecting the online attention of a person. Users respond better and are more attentive to online content when the content is provided with their names. It has been found that using self-referent names significantly impacts the attention of a person (Tam and Ho 2006).

3.2 Content relevance

Content relevance involves providing content to a user based on his or her processing goal. The cognition effect of user changes based on the personalization provided to him or her. The content provided to users is dynamic and changes from person to person. Changing the content provided to users involves capturing the online behaviour of users, modelling them and providing contents that are relevant to a user based on the model.

3.3 Navigational content

The hierarchy of web pages produced to users can be dynamic and user oriented. The flow of webpages could change based on the preference models of users. There are numerous

algorithms delivering navigational rearrangement of web pages based on customer behavior.

We extend the UTAUT2 model by including Web Personalization as a moderator which could influence the relationship between antecedents of behavioral intention and the outcome variable. The proposed research model is shown in Fig. 1. The six constructs from UTAUT2 namely performance expectancy, effort expectancy, facilitating conditions, hedonic motivation, price and habit are expected to have a positive influence on intention to use E-Government services in the presence of Web Personalization. Social influence is defined as the perception of how important others believe that he or she should use the system (Venkatesh et al. 2003). E-Government adoption has been reportedly influenced positively by others who use the system (e.g.,: Bhatnagar 2009) and as such we expect that this variable will have a direct influence on the intention to use. However we do not have reasons to posit that personalized web would moderate the social influence aspect of technology acceptance on the intention to use. Unlike customization, personalization here is a

Table 1 Measurement constructs and items used

Construct	Reference	Items
Web Personalization (WBP)	Tam and Ho 2006	WBP01: Names appeared in Banners
		WBP02: Personalized messages were given
		WBP03: Product offers were given
		WBP04: Personalized offers were given
		WBP05: Tailored offers were provided
	Tam and Ho 2006	WBP11: Banner message content enabled quicker task accomplishment
		WBP12: Banner message content improved task performance
		WBP13: Banner message content enhanced effectiveness
		WBP14: Banner message makes task easier
		WBP15: Banner messages useful
Performance Expectancy (PFE)	Venkatesh et al. 2012	PFE01: Internet useful in accessing Passport services
		PFE02: Online Passport (OP) enables to accomplish task quickly
		PFE03: OP increases productivity
Effort Expectancy (EFE)	Venkatesh et al. 2012	EFE01: OP is easy to learn
		EFE02: Interaction with OP is clear and understandable
		EFE03: OP is easy to use
		EFE04: Easy to become skilful in OP
Facilitating Conditions (FAC)	Venkatesh et al. 2012	FAC01: Presence of resources necessary to use OP
		FAC02: Knowledge necessary to use OP
		FAC03: Compatibility of OP to other technologies
		FAC04: Help from others when using OP
Hedonic Motivation (HED)	Venkatesh et al. 2012	HED01: Fun in OP
		HED02: Enjoyment in OP
		HED03: Entertainment in OP
Price (PRI)	Venkatesh et al. 2012	PRI01: Reasonable price
		PRI02: Value for money
		PRI03: Current cost value
Habit (HAB)	Venkatesh et al. 2012	HAB01: Use of E-Government services is habitual
		HAB02: Addiction to use E-Government Services
		HAB03: Must use of E-Government Services
		HAB04: Continued usage of E-Government Services
Behavioural Intention (BEI)	Venkatesh et al. 2012	BEI01: Recommend use of OP to others
		BEI02: Try to use OP when possible
		BEI03: Continue to use OP in future
Social Influence (SOI)	Venkatesh et al. 2012	SOI01: Thoughts of people who are important to me
		SOI02: Thoughts of people who influence my behaviour
		SOI03: Thoughts of people whose opinions are valued

characteristic of technology which is specific to a person and as such we do not expect that web personalization would alter others' influence on the intention to use a technology.

Performance expectancy construct in the UTAUT model is defined as the degree to which an individual in an organization believes that using the technology will give gains in one's job performance. This construct has been found to be the strongest predictor of intention (Venkatesh et al. 2003). In UTAUT2 this construct is defined independent of an organizational setting and depicts how an individual expects her or his performance of a given task would benefit by the use of technology. Performance expectancy in the context of online usage of a Government service is about how a user expects a technology to help complete a given task. Thus, we hypothesize that:

H1   Performance expectancy will have a stronger impact on intention to use E-Government services under a higher level of Web Personalization, all else being equal.

Effort expectancy is defined as the degree of ease associated with the use of the technology under consideration (Venkatesh et al. 2003). This construct in UTAUT has been derived from previous models of technology acceptance and it essentially conveys the degree of ease in the use of a technology. In the consumer context it is associated with the ease of completing a given task with the use of technology (Venkatesh et al. 2003, 2012). Previous research has shown that web personalization, particularly content relevance, moderates goal specificity and cognitive processing relationship of user decision process in online environment and thus influences buying decision (Tam and Ho 2006). Thus, we hypothesize that:

H2a   Effort expectancy will have a stronger impact on intention to use E-Government services under a higher level of Web Personalization, all else being equal.

Web personalization facilitates self-reference, content relevance, and navigational content, which help minimize the cognitive load on the user when performing a particular task. For example, web personalization enables customization of the content, auto fill appropriate personal information when needed, and provide context sensitive help. Thus, one would expect web personalization to result in quicker task completion as well as executing the tasks without errors. By performing the tasks quickly and efficiently, users are likely to be more satisfied with the e-government web application and hence more likely to adopt the technology. With respect to task completion, the overall time
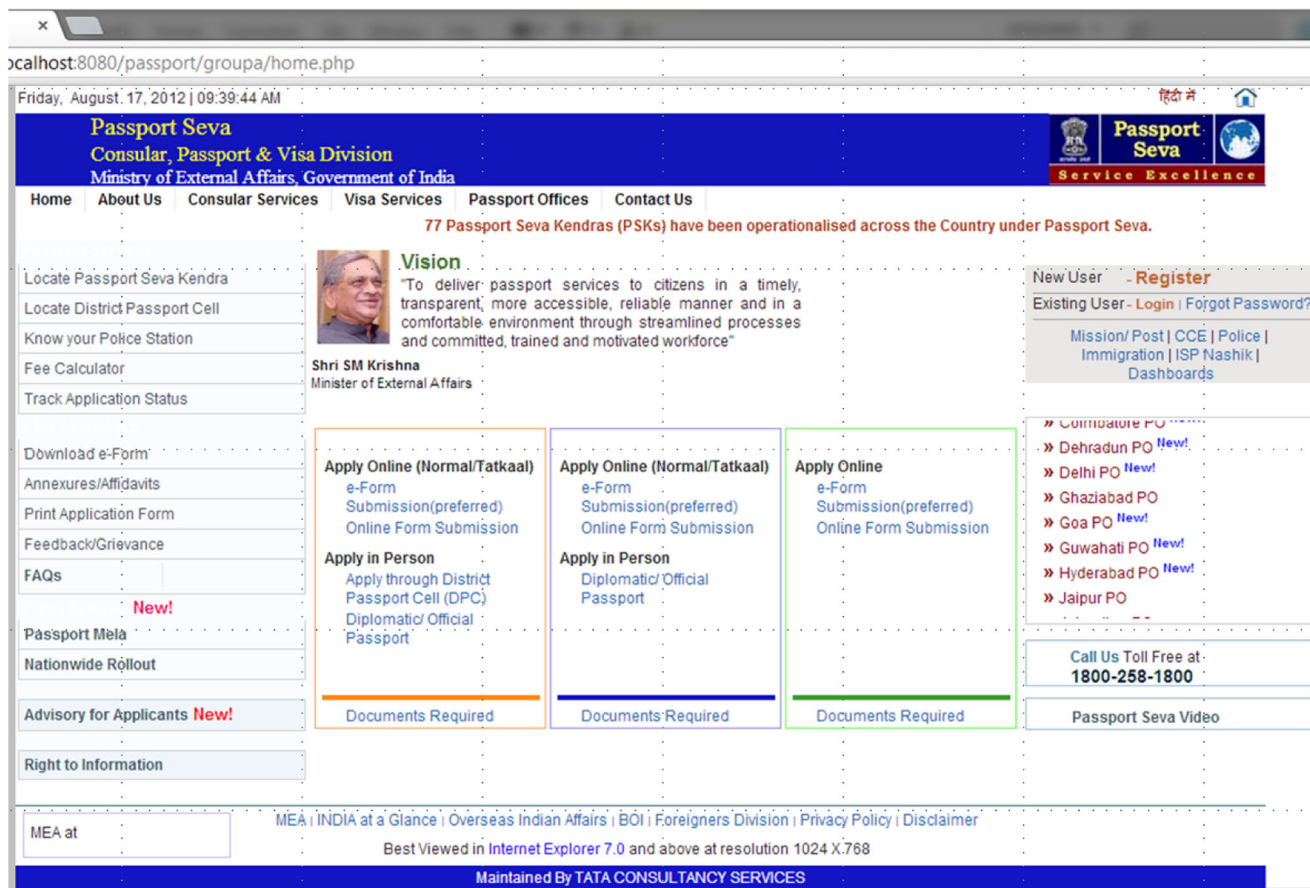

Fig. 2 Introduction Page – Without Personalization

taken to complete tasks by users can be measured and compared. Since web personalization provides guidance and all the necessary information readily, users with this capability will finish the tasks quickly. Hence, we expect that actual efficiency will increase with web personalization and hypothesize the following:

H2b Users with access to Web Personalization will complete the tasks in a shorter time compared to users not having access to Web Personalization, all else being equal.

Facilitating conditions embody the three concepts of perceived behavioral control, facilitating conditions, and compatibility. Thus, facilitating conditions signify the degree to which an individual believes that organizational and technical infrastructure exists to support the use of the technology (Venkatesh et al. 2003). In the case of online E-Government services, consumers have different levels of access to information and other resources that facilitate the use of online channels. More specifically, in the Indian context where a citizen makes several visits to Government departments for a service and very little help is available on the phone (Bhatnagar 2009, p. 82), presence of online help would make intention to use web based services stronger than

the absence of it. Therefore, we expect that in the presence web personalization facilitating conditions will have a stronger impact on the intention to use an online channel. Thus, we hypothesize as follows:

H3 Facilitating conditions will have a stronger impact on intention to use E-Government services under a higher level of Web Personalization, all else being equal.

Hedonic motivation is a new construct introduced in UTAUT2 and it is defined as the fun or pleasure derived from using a technology (Venkatesh et al. 2012). Hedonic motivation comprises of innovativeness, novelty seeking and perceptions of novelty of a technology could influence the behavioral intention to use a particular technology (Venkatesh et al. 2012). As web personalization includes personal stimuli which is recognized as novelty by the seeker (Tam and Ho 2006), we expect that hedonic motivation will have a stronger impact on intention to use in the presence of web personalization. Thus, we hypothesize that:

H4 Hedonic motivation will have a stronger impact on intention to use E-Government services under a higher level of Web Personalization, all else being equal.

In consumer setting, the cost of using a technology is

Fig. 3 Introduction Page – With Personalization

Fig. 4 Registration Page – Without Personalization

born by the user as against an organizational setting. UTAUT2 conceptualizes price value as the perceived trade-off between the benefits of using technology and the cost involved, and reports that price value positively influences the intention to use a new technology. Similar to a commercial setting where price value could be a determinant of intention to use a technology, perceived benefit-cost trade off of availing a service could be a key determinant of intention to use an online service in the E-Government context. The perception of cost could be reduced by the reduction in transaction costs experienced by the users while using an online channel. In the presence of personalized content we expect that perception of cost will be lower and overall price value will be more (Venkatesh et al. 2012). Thus, we hypothesize as follows:

H5   Price value will have a stronger impact on intention to use E-Government services under a higher level of Web Personalization, all else being equal.

UTAUT2 defines habit as a combination of prior behavior and the degree to which it is automated and distinguishes it from experience. Experience does not necessarily lead to habit formation. Passage of

chronological time could lead to differing degrees of habit based on the extent of interaction and familiarity formed with the target technology (Venkatesh et al. 2012). Self referent personalization catches the attention of users (Tam and Ho 2006) and as such we expect that it will provide a greater impact on habit to drive intention to use. In the context of web based e-Government services, we contend that personalized web would positively impact the relationship between habit and intention to use. Thus, we hypothesize as follows:

H6   Habit will have a stronger impact on intention to use E-Government services under a higher level of Web Personalization, all else being equal.

4 Research methodology

The effectiveness of web personalization and its impact on behavioral intention to use technology was assessed by conducting a laboratory experiment and administering a post experiment survey. The results obtained from the control group (without web personalization) were compared against

Fig. 5 Registration Page – With Personalization

those obtained from the treatment group (with web personalization) when carrying out a particular task in the context of e-government services. Quantitative metrics such as task completion time as well as a post experiment survey were used to study the effect of web personalization and validate the research model discussed in the previous section.

4.1 Experimental evaluation

In this study, we have utilized an experimental design in a laboratory setting for data collection. Our research design is intended to collect responses from two groups, the treatment group which received personalized content while using a web technology for an E-Government service, and the control group which did not receive any personalized content. The target audience consisted of students from a premier academic institute of technology for higher education in Southern India. This one factor two level experiment is followed by administration of a questionnaire to understand the impact of Web Personalization in intention to use E-Government service. Indian Government's Ministry of External Affairs website for passport (http://passportindia.gov.in/) was chosen as our E-Government service site for the experimental purpose. We

chose this online E-Government service as the most appropriate application for our study because online passport service is one of the important E-Government services targeting majority of citizens. While the recurrent use of the E-Government passport services may not happen every day, users of the service can greatly influence other citizens to use the services through word of mouth.

An impact assessment of major E-Government projects was recently conducted under the directive of the Department of IT, Government of India.[1] The passport site was found to have less impact when compared to other channels. Hence choosing passport site for understanding the consumer intention to use technology was more relevant. In order to overcome the cost to the citizens in the manual process of passport related filings, 'Passport Seva' was introduced as a web application with a user interface that provided various options for different passport related needs of the citizens. However, the current passport site does not have personalization capability. There was redundancy in data capture and also certain degree of ambiguity as few questions posed were unclear and not

_____
[1] Impact Assessment of E-Government Services, Ministry of Communications and Information technology, Government of India, 2008.

Fig. 6 Identifying the User - Self-reference Example with Personalization

self-explanatory. Further, the site asked for some information such as Police Station code which the user might be unaware at the time of filing. Hence, the web interface must provide support for online filing. When the data provided to customers are personalized and remembered by the system, we expect that customers would accept the system and tend to revisit the site. Also, recurrent use of the system for various passport related services such as updating personal information, adding more pages to the passport, etc. might become common as today's passports have limited pages and frequent foreign travel is common among the large technology and business professionals.

4.2 Post experiment survey

A post experiment survey was used to validate the research model presented in Fig. 1. The items used in the survey were derived from previously tested and validated instruments. The items pertaining to Web Personalization were derived from Tam and Ho (2006). In general, Web Personalization can be segregated as self-referent, content relevant or navigation based personalization for user (Tam and Ho 2006). The

cognition behaviour of users is affected by Web Personalization and impacts decision making and information processing capabilities.

Our measurement model combined the various items developed by Tam and Ho (2006) into one construct, which was labeled as Web Personalization. All items pertaining to consumer technology acceptance were adapted from Venkatesh et al. (2012) and were customized to the context of our study. Likert scale in the range of 1 to 5 was used for measurement. Table 1 provides the constructs and items of our measurement model.

4.3 Experimental procedure

Our experiment was conducted in the IT Lab of a premier national Institute with students as target audience. The instrument was administered in English, as the medium of instruction in the given institute was English. A pilot study was conducted with research students before the start of the actual experiment to ensure content validity of the instrument used in the study. The students participating in the subsequent experiment were offered vouchers from an online book store as

Fig. 7 Reissue Details Page – Without Personalization

incentive to participate in the experiment. Totally 10 vouchers were given to ten students selected by a lottery system. The Passport site was mirrored and was run on a local server. We developed two sets of passport applications, one with normal passport site forms and other with passport site personalized based on user specific data. Items in the passport site that could be personalized based on self-reference and content relevance were chosen. These items such as buttons and text messages were personalized based on user information such as name and location.

The respondents were organized randomly into two groups, Group A and Group B. The laboratory housed personal computers of the same make and similar configuration (Hewlett Packard PCs with Intel Dual Core Processors). Group-A received a set of pages without personalization and formed the control group. Group-B members were provided the web personalization capability and thus formed the treatment group. The sample size was 143 and participants had an average age of 23.3 years, maximum age of 36 years and minimum 19 years. Average work experience of the participants was 1.9 years. In the sample, 82 % of the participants were male and t 18 % female.

Participants from the both the groups were given the same task to compare the impact of the personalization. They were given three tasks: a) register in the portal, b) then login, and c) apply for reissue of passport. Registration is a default task in most web portals and is mandatory in the passport site. Hence registration was chosen as the first task to be done. Login enables the portal to identify the user and provide suitable content. Reissue of passport was the final task chosen and it provides more scope for personalization elements than application of new passport. Self-reference and content relevance were chosen as the personalization methods. Banner, tool tip, highlight, bold and colors were chosen as personalization elements. The treatment group was provided with the personalization elements and the personalization methods whenever applicable. The treatment group users were addressed as guests initially and later addressed with their first name after logging in. Figures 2 and 3 show the screenshots of the "Introduction" page. In the personalized version (Fig. 3), the user is addressed as "guest" and directed to register with the site.

With personalization, the navigation elements were highlighted and made bold for easy access in the web portal. Only the content relevant navigation elements were

Fig. 8 Reissue Details Page – Auto Filling of Information with Personalization

highlighted. The content relevance here is registration, login and reissue of passport. Other navigation elements which were not relevant were subdued. Some of the entries requested in the registration page were vague and not clear in the normal passport site (Fig. 4). For example, the "Given Name" field actually included the middle name as well. Those entries were provided with tool tips for treatment group (Fig. 5). When the user completes the registration step and logs into the system, he or she is identified by name (self-reference) and appropriate hyperlink on the page is highlighted for further action. As seen in Fig. 6, the user's name is mentioned and the "Apply for Fresh Passport/Reissue of Passport" link has been highlighted. Most of the information that was provided by the user during registration was used to auto complete the required fields when the same user performed the reissue task. For example, age, date of birth, email, location are some of the data entries which were stored during registration and provided back through auto fills during the reissue task. Figure 7 shows the passport "Reissue Details" page where the user has to explicitly enter all the required information. In contrast, Fig. 8 shows

the personalized reissue page where some of the information has already been auto filled and the user has to enter only a few items.

Prior to the start of the experiment the participants were asked to enter their basic details and other demographic information. The information collected include name, gender, address, date of birth, educational background, work experience, if already has a passport, previous experience with passport portal and email id. The session time was tracked and the number of web pages visited was also recorded. A questionnaire was administered to the students at the end of the

Table 2 Task completion time for treatment and control group

Parameter	Treatment Group WBP=Yes (n1=65)	Control Group WBP=No (n2-=68)	p
Average time taken to complete forms (min)	8.08	8.82	0.04

Table 3 Reliability and validity tests (n=143)

Variable	Manifest variables	C. alpha	DG.rho	Eigen1st	Eigen 2nd	Std loadings
Performance Expectancy (PFE)	3	0.836	0.902	2.26	0.455	0.887,0.818,0.898
Effort Expectancy (EFE)	4	0.880	0.918	2.95	0.488	0.875,0.858,0.897, 0.800
Facilitating Conditions (FAC)	3	0.859	0.914	2.34	0.395	0.831,0.817,0.764, 0.632
Hedonic Motivation (HED)	3	0.856	0.913	2.33	0.388	0.872,0.877,0.895
Price (PRI)	3	0.852	0.910	2.31	0.403	0.894,0.851,0.889
Habit (HAB)	4	0.747	0.840	2.27	0.887	0.682,0.681,0.813, 0.809
Behavioral Intention (BEI)	3	0.863	0.917	2.36	0.391	0.865,0.895,0.894
Social Influence (SOI)	3	0.859	0.914	2.34	0.395	0.900,0.869,0.879

experiment and the data was collected as web form submission. The items given in Table 1 were covered in the questions. The ordering and the content was modified to avoid halo effect and to avoid the repetitive nature of the questions. The basic data and questionnaire response were stored as text files and processed. The session time was noted and the average time taken by the groups was calculated.

5 Analyses

5.1 Task completion

The treatment group (n1=65) completed the tasks on an average of 8.08 min and the control group (n2=68) completed the tasks in 8.82 min. Web Personalization clearly enabled faster completion of the tasks.

A Student's t-test was performed on the data which resulted in a probability of 0.04 with two tailed distribution (Table 2). As $p<0.05$, the difference between the two groups is significant at 95 %.

The results thus show that the treatment group completed the test quicker than the control group and the difference between the two groups is statistically significant for the task completion time. Thus, H2b is supported. This finding has important practical implications as to how web personalization can significantly impact personal efficiency of individual

users which could further boost usage of E-Government services.

5.2 Technology acceptance

Partial Least Squares (PLS) path modeling was used in R statistical package version 2.15 for Structural Equation Modeling (SEM). Measurement model estimation involved confirmatory factor analysis (CFA) and reports results of construct uni-dimensionality, validity and reliability. Measurement model was valid in our research indicating internal consistency, reliability and discriminant validity. The results show Cronbach's α, DG ρ and Average Variance Explained. All item loading were>0.6; all the values of Cronbach's α and Dillon-Goldstein's ρ were above 0.7 (Table 3). The difference between first and second Eigenvalues were more than one and also positive to indicate the factor loadings are appropriate (Hair et al. 2007; Tenenhaus et al. 2005).

Following Gefen and Straub (2005) a further comparison of the square root of Average Variance Extracted (AVE) of individual constructs with the correlation of constructs with one another was carried out. As given in Table 4, we observed that all AVEs were above 0.7, against the prescribed threshold of 0.5; and all AVEs were larger than the correlations except Facilitating Conditions. However since the differences were small Facilitating Conditions was not dropped from the model.

Table 4 Discriminant validity (n=143)

	PFE	EFE	SOI	FAC	HED	PRI	HAB	BEI
PFE	0.868							
EFE	0.846(**)	0.858						
SOI	0.725(**)	0.672(**)	0.882					
FAC	0.789(**)	0.834(**)	0.635(**)	0.764				
HED	0.553(**)	0.559(**)	0.413(**)	0.501(**)	0.880			
PRI	0.747(**)	0.694(**)	0.579(**)	0.750(**)	0.506(**)	0.878		
HAB	0.652(**)	0.575(**)	0.526(**)	0.657(**)	0.649(**)	0.729(**)	0.748	
BEI	0.742(**)	0.706(**)	0.654(**)	0.710(**)	0.523(**)	0.855(**)	0.741(**)	0.884

In summary, the results of our measurement model analysis indicate that the blocks are uni-dimensional, and satisfy the conditions of measurement reliability and validity.

5.2.1 Structural model

The results of the structural model have been presented in Table 5. We followed two approaches to test the proposed models: (i) a full structural model with endogenous, exogenous and interaction variables and (ii) Block by block multiple regression (MR) models with and without interaction terms to test moderation effect, similar to the approach followed in Liang et al. (2007, p.69). Since all our variables had reflective measures with interval scales, we took product term approach whereby the moderating effects are measured as product terms of the independent variables and the moderator variables (Henseler and Fassott 2010, p. 723). We followed the method suggested by (Joreskog and Wang 1996) and the mean of the indicators of the latent independent variables were multiplied with the mean of the indicators of the latent moderator variable. As the sample size was relatively low (143), we used bootstrapping to scale up the sample size to 500 for significance testing (Hesterberg et al. 2006).

Social influence, price and habit were significant ($p<0.05$) in the direct effects while other relationships were not significant. Three constructs were significantly affecting the Behavioral Intention in the presence of web personalization; three of our hypotheses were supported viz: the moderating effect of web personalization on the relationship of effort expectancy (H2a), hedonic motivation (H4) and Price (H5) on behavioral intention.

Table 5 Structural model ($n=500$ after bootstrapping)

Behavioral intention	Direct effect	Standard error	Interaction effect	Standard error
R square	0.723		0.604	
PFE	0.078	0.059	0.149*	0.020
EFE	0.036	0.058	0.135*	0.027
SOI	0.130*	0.072	0.139*	0.023
FAC	0.042	0.065	0.149*	0.021
HED	−0.045	0.078	0.063*	0.031
PRI	0.476*	0.068	0.257*	0.038
HAB	0.272*	0.073	0.187*	0.037
PFE * WBP (H1)	–		−0.010	0.013
EFE * WBP (H2a)	–		−0.024*	0.016
FAC * WBP (H3)	–		−0.024	0.016
HED * WBP (H4)	–		−0.038*	0.019
PRI * WBP (H5)	–		0.023*	0.013
HAB * WBP (H6)	–		−0.007	0.015

*Significant at 95 %

6 Discussion

Web Personalization doesn't have a significant moderation effect on the relationship between Performance Expectancy and Behavioral Intention (H1). According to UTAUT Performance Expectancy is defined as the degree to which using a technology will provide benefits to consumers in performing certain activities. Unlike the findings reported by Venkatesh et al. (2012), Performance Expectancy also did not have a direct and significant effect on Behavioral Intention. Our results suggest that E-Government Passport site cannot be related to a job related or task related performance improvement as such. In consumer context it is related to improvement in task oriented efficiency. Though web personalization has contributed to the reduction in task completion time (H2b), it appears that users could not attribute the performance improvement from E-Government passport site to the presence of web personalization. Hence, there is no discernible moderating effect of Web Personalization on the relationship between Performance Expectancy and Behavioral Intention. Web Personalization did not significantly moderate the effect of Facilitating Conditions on Behavioral Intention as well (H3). Facilitating Conditions refer to consumer's perceptions of the resources and support available to perform a task. We didn't provide any help resources or technical support for using the E-Government Passport site. The moderation effect of Web Personalization on Facilitating Conditions was not significant. Further, Web Personalization didn't have any significant effect on the impact of Habit on Behavioral Intention (H6). Habit is defined as having prior experience in using the technology and the extent to which an individual believes the behavior is automatic. According to Venkatesh et al. (2012) habit is an important construct in affecting behavioral intention to use the system. Hence habit was included in the model. However our results did not provide support for the moderating effect of Web Personalization in the relationship of Habit on Behavioral Intention. The usage of passport site was new to many users and there was no prior experience in using the system. Also the users were made to use the system only once during the time of the experiment and there was no pre and post testing of the usage behavior. Hence their habitual behavior of using the system was not significantly affected by the moderation effect of Web Personalization.

Contrary to hypothesis H2a, Web Personalization negatively and significantly affected the relationship of Effort Expectancy on Behavioral Intention. When revisited the theory, women tend to plan the effort required for any task before starting any work (Venkatesh et al. 2003). In the sample studied, 82 % participants were male as against 18 % female. The sample was skewed towards men and hence consisted of majority of respondents who did not form expectations about effort required to carry out the task. This possibly explains why there was no positive moderation effect of Web

Personalization on this relationship. Since female members were very few, the moderation effect was possibly negative.

The effect of Hedonic motivation on Behavioral Intention was negatively and significantly moderated by Web Personalization (H4). Hedonic motivation is defined as the fun and pleasure of using a technology. For some users, innovativeness and novelty in using the technology is an important determinant in using the technology. When consumers begin to use a technology, they give more importance to novelty and later it reduces. However, a web interface for E-Government service is essentially for utility; fun and pleasure are not intended and expected. Therefore any element of novelty and fun perceived through web personalization is likely to make hedonic motivation have negative effect on intention to use. Further, previous study has shown that younger men tend to give more importance to novelty in technology (Chau and Hui 1998). As explained earlier, the participants of the experiment were young people and majority of them were male. This possibly explains the negative moderating effect of web personalization on Hedonic motivation to Behavioral Intention relationship.

As hypothesized, Web Personalization significantly moderated the effect of price value on behavioral intention and thus H5 was supported. In organizational context, an employee's perception of price value follows a mental estimation of benefit vs cost that one could identify in the use of the new system. However in a consumer setting, the costs are often more direct such as the cost of visiting Government offices many times and the cost of corruption (Bhatnagar 2009). Our results show that personalized web mitigates the risk of using an unknown interface for Government services. This shows some evidence for the role of web personalization in influencing the perception of cost by E-Government consumers.

7 Conclusion

This study makes three important contributions to the body of knowledge in information systems. First, studies on web personalization from information systems perspective have been scarce as most studies in this area have algorithmic or recommender systems focus. Second, this research extends the UTAUT2 model proposed for understanding user behavior in technology acceptance by including web personalization as a moderator. Third, studies on Web Personalization have been predominantly focused on E-Commerce domain as recommender systems generated potential financial benefits for firms engaged in using Internet channels for business transactions. This study addressed this research gap by empirically studying the influence of Web personalization in a user's intention to use technology in an E-Government context. In turn this study also contributes to the body of knowledge in E-Government as empirical studies with theoretical frameworks

have been reportedly scanty in this domain (Heeks and Bailur 2007, p.252).

Notwithstanding the important contributions to the body of knowledge related to Web Personalization, there are also some limitations to this study which might restrict the application and generalization of the findings. This study used a sample of undergraduate and graduate students from a premier engineering Institution. As the sample represents an educated population, results may fail to generalize to citizens with different demographic characteristics. Also, the sample chosen had most representation from male students and is skewed towards one category. Further, the sample size was relatively small, and an attempt was made to overcome this limitation by using sub sampling following bootstrapping method.

The findings from this study have generated some useful insights for management practice, particularly in E-Government services design and implementation. With the growing adoption of the Internet and improved quality of service through electronic channels, higher levels of user acceptance in E-Government would serve to improve quality of Governance. As commercial web applications have successfully implemented personalized services, web based E-Government services could also benefit from embedding Web Personalization strategies in delivering services. This strategy could potentially improve the use and decision to re-use E-Government portals by citizens, as in the case of students seeking passport services. Further studies could empirically test the change of user acceptance behavior with gender, age, income, education and other demographic attributes. Future studies could also focus on the impact of web personalization in E-Government services with different characteristics such as Central, and local Governments services.

References

Adomavicius, G. & Tuzhilin, A. (2011). Context-aware recommender systems, *Recommender Systems Handbook*, pp. 217–253.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*(2), 179–211.

Arora, N., Dreze, X., Ghose, A., Hess, J. D., Iyengar, R., Jing, B., et al. (2008). Putting one-to-one marketing to work: personalization, customization, and choice. *Marketing Letters, 19*(3–4), 305–321.

Bhatnagar, S. (2009). *Unlocking E-Government potential- concepts, cases and practical insights*. New Delhi: Sage Publications.

Carter, L., & Weerakkody, V. (2008). E-government adoption: a cultural comparison. *Information Systems Frontiers, 10*, 473–482. doi:10. 1007/s10796-008-9103-6.

Chau, P. Y., & Lung Hui, K. (1998). Identifying early adopters of new IT products: a case of windows 95. *Information & Management, 33*(5), 225–230.

Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340.

Dombeu, J.V.F., & Huisman, M. (2011). Semantic-driven e-government: A case study of formal representation of government domain ontology. In *IST-Africa Conference Proceedings, 2011* (pp. 1–9). IEEE.

Dombeu, J.V.F., & Huisman, M. (2013). Practicing Semantic web Technologies in e-Government. In *Proceedings of the 13th European Conference on eGovernment: ECEG 2013* (p. 166). Academic Conferences Limited.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading: Addison-Wesley.

Gao, M., Liu, K., & Wu, Z. (2010). Personalisation in web computing and informatics: theories, techniques, applications, and future research. *Information Systems Frontiers, 12*(5), 607–629.

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using pls-graph: tutorial and annotated example. *Communications of the Association for Information Systems, 16*, 109.

Hair, J. F., Jr., Money, A. H., Samouel, P., & Page, M. (2007). Research methods for business, John Wiley and Sons, Ltd.

Hamner, M., Negrón, M. A., Taha, D., & Brahimi, S. (2012). e-Government Implementation in a Developing Country: A Case Study. *Managing E-government Projects: Concepts, Issues and Best Practices*, 262.

Han, L., & Li, M. (2010). Application and research on ontology in e-Government workflow model. *International Conference on Computer, Mechatronics, Control and Electronic Engineering (CMCE 2010)*, (pp. 474–477).

Heeks, R., & Bailur, S. (2007). Analyzing e-government research: perspectives, philosophies, theories, methods, and practice. *Government information quarterly, 24*(2), 243–265.

Henseler, J. & Fassott G. (2010) *Testing moderating effects in PLS path models: An illustration of available procedures*, Handbook of Partial Least Squares, Springer, 713–735.

Hesterberg, T., Moore, D. S., Monaghan, S., Clipson, A., & Epstein, R. (2006). Chapter 14: Bootstrap methods and permutation tests. In D. S. Moore & G. P. Mccabe (Eds.), *Introduction to the practice of statistics*. New York: Freeman.

Hind, L., Chiadmi, D., & Benhlima, L. (2014). How semantic technologies transform e-government domain: a comparative study and framework. *Transforming Government: People, Process and Policy, 8*(1), 49–75.

Hong, W., Thong, J., & Tam, K. (2004). Does animation attract online users' attention? The effects of flash on information search performance and perceptions. *Information Systems Research, 15*(1), 60–86.

Hsu, I. C. (2013). Personalized web feeds based on ontology technologies. *Information Systems Frontiers, 15*(3), 465–479.

Jiang, Z. (2007). The effects of presentation formats and task complexity on online consumers' product understanding. *MIS Quarterly, 31*(3), 475–500.

Joreskog, K. G., & Wang, F. (1996). Nonlinear structural equation models: The Kenney-Judd model with interaction effects. In R. E. Shumacker & G. A. Marcoulides (Eds.), *Advanced structural equation modeling: Issues and techniques* (pp. 57–58). Mahwah: Lawrence Erlbaum.

Kobsa, A. (2001). Generic user modeling systems. *User modeling and user-adapted interaction, 11*(1), 49–63.

Komiak, S. Y. X., & Benbasat, I. (2006). The effects of personalization and familiarity on trust and adoption of recommendation agents, *MIS Quarterly, 30*(4), 941–960.

Krishnaraju, V., & Mathew, S. K. (2013). Web personalization research: an information systems perspective. *Journal of Systems and Information Technology, 15*(3), 254–268.

Li, D., & Liu, X. L. (2012). A model for E-government information resource integration based on ontology. *Applied Mechanics and Materials, 220*, 2364–2370.

Liang, C., Yang, D., & Si, G. (2012). Ontology based personalized catalog system of e-government information resource. *Journal of Tsinghua University Science and Technology, 52*(11), 1650–1656.

Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: the effect of institutional pressures and the mediating role of top management. *MIS Quarterly 31*, 59–87.

Maigre, R., Grigorenko, P., Haav, H. M., & Kalja, A. (2013, January). A semantic method of automatic composition of e-government services. In *Databases and Information Systems VII: Selected Papers from 10th Int. Baltic Conf. on Databases and Information Systems, Baltic DB&IS 2012* (pp. 204–217).

Mirchandani, D. A., Johnson, J. H., & Joshi, K. (2008). Perspectives of citizens towards e-government in Thailand and Indonesia: a multi-group analysis. *Information Systems Frontiers, 10*(4), 483–497.

Mobasher, B., Cooley, R., & Srivastava, J. (2000). Automatic personalization based on web usage mining. *Communications of the ACM, 43*(8), 142–151.

Nunes, P. F., & Kambil, A. (2001). Personalization? No Thanks!, *Harvard Business Review, 79*(4), 32–34.

Peterson, R., Balasubramanian, S., & Bronnenberg, B. (1997). Exploring the implications of the internet for consumer marketing. *Journal of the Academy of Marketing Science, 25*(4), 329–346.

Prahlad, C. K., & Krishnan, M. S. (2008). The new age of innovation: *driving co-created value through global networks*, Tata McGraw-Hill, New Delhi.

Rana, N. P., Dwivedi, Y. K., & Williams, M. D. (2013). A meta-analysis of existing research on citizen adoption of e-government. *Information Systems Frontiers*. doi:10.1007/s10796-013-9431-z. Published online: 16 April 2013.

Rana, N. P., Dwivedi, Y. K., Williams, M. D., & Weerakkody, V. (2014). Investigating success of an e-government initiative: validation of an integrated IS success model. *Information Systems Frontiers*. doi:10.1007/s10796-014-9504-7. Published online: 23 May 2014.

Schafer, J., Konstan, J. & Riedi, J. (1999). Recommender systems in e-commerce, *Proceedings of the 1st ACM conference on Electronic commerce, ACM*, 158–166.

Sheng; L., & Lingling, L. (2011). Application of Ontology in E-Government. *Fifth International Conference on Management of e-Commerce and e-Government (ICMeCG 2011)*, (pp. 93 – 96).

Silcock, R. (2001). What is e-government? *Parliamentary affairs, 54*(1), 88–101.

Sinha, B., Chandra, S., & Garg, M. (2015). Development of ontology from Indian agricultural e-governance data using IndoWordNet: a semantic web approach. *Journal of Knowledge Management, 19*(1).

Stevens, R., Robinson, A., & Goble, C. (2003). Mygrid: personalised bioinformatics on the information grid. *Bioinformatics, 19*(1), 302.

Tam, K. Y., & Ho, S. Y. (2006). Understanding the impact of web personalization on user information processing and decision outcomes. *MIS Quarterly, 30*(4), 865–890.

Taylor, S., & Todd, P. (1995). Understanding information technology usage: a test of competing models. *Information Systems Research, 6*(2), 144–176.

Tenenhaus, M., Vinzi, V. E., Chatelin, Y-M., & Lauro, C. (2005). PLS path modeling. *Computational Statistics and Data Analysis, 48*(1), 159–205.

Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: toward a unified view. *MIS Quarterly, 27*(3), 425–478.

Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Quarterly, 36*(1), 157–178.

Vo, G. N., & Lai, R. (2014, May). A method for simplifying the submission of an online request for an E-Government service. In *Technology Management and Emerging Technologies (ISTMET), 2014 International Symposium on* (pp. 377–382). IEEE.

Weerakkody, V., Irani, Z., Lee, H., Osman, I., & Hindi, N. (2013). E-government implementation: a bird's eye view of issues relating to costs opportunities, benefits and risks. *Information Systems*

Frontiers. doi:10.1007/s10796-013-9472-3. Published online: 17 December 2013.

Willcocks, L., Feeny, D., & Olson, N. (2006). Implementing core IS capabilities: Feeny-Willcocks IT governance and management framework revisited. *European Management Journal, 24*(1), 28–37.

Yildiz, M. (2007). E-government research: reviewing the literature, limitations, and ways forward. *Government Information Quarterly, 24*(3), 646–665.

Zakaria, M.R. (2013). Personalized E-government System: Towards an Adaptive Maturity Model. *International Journal of Business Information and Technology (IJBIT), 2*(1).

Zhao, J., Su, H., Dong, Y., & Zhang, Z. (2013). *An ontology model for user-centered e-government in China. In LISS 2012* (pp. 1339–1344). Berlin Heidelberg: Springer.

Vinodh Krishnaraju is a Data Scientist at Xoanon Analytics, India. Vinodh's area of interest are building statistical and analytical models in telecom and web data. His expertise lies in building predictive models in scalable big data architecture. His work at Xoanon analytics involves, building analytics models and architecture for Reporting and Analytics on Telecom Data. Prior to Xoanon Analytics, he worked as an independent consultant for leading Movie theater chain, where his primary work was prediction models for forecasting and attendance. He has worked on CRM data storage and analysis as part of consulting work. He did his Master of Science at IIT Madras. He worked on "Web Personalization and recommender system models for web applications" as part of his Masters Research Work. He was a research assistant at IIT Madras. Prior to doing his Masters, he was working with Ericsson R&D, India. He was involved in Analytics Suite product building where his primary goal was to build specific data mining models for telecom customer segmentation and profiling.

Dr. Saji K. Mathew is currently an Associate Professor at the Department of Management Studies, Indian Institute of Technology Madras. His PhD research and subsequent academic work focused on the role of Information Technology in Business and Management. As a Fulbright Scholar, he studied risk mitigation in offshore IT outsourcing in the Indo-US context at the Goizueta Business School of Emory University, Atlanta (USA). His present research interests cover strategies in offshore IT outsourcing, issues in IT infrastructure management services, and data mining and business intelligence. His articles have been published in reputed international journals. He has about 10 years of work experience in the area of industrial automation in the Indian industry covering private and public sector companies. He has provided industrial training and consulting for companies such as Exxon Mobile, Genpact, HP Globalsoft, Oracle India, Primus Retail, L&T and Hindustan Aeronautics Limited in addition to sponsored research projects for Nissan, Hand in Hand, Infosysand DSIR. He teaches courses such as Management Information Systems, Data Warehousing and Data Mining, IT Services & Outsourcing, Information Systems Development and Research in IT and Organizations.

Vijayan Sugumaran is Professor of Management Information Systems and Chair of the Department of Decision and Information Sciences at Oakland University, Rochester, Michigan, USA. He was WCU Visiting Professor at Sogang University, Seoul, South Korea from 2010 to 2012. He received his Ph.D in Information Technology from George Mason University, Fairfax, Virginia, USA. His research interests are in the areas of Intelligent Information Technologies, Ontologies and Semantic Web, Intelligent Agent and Multi-Agent Systems, and Component Based Software Development. He has published over 150 peer-reviewed articles in Journals, Conferences, and Books. He has edited twelve books and serves on the Editorial Board of numerous journals. He has published in top-tier journals such as Information Systems Research, ACM Transactions on Database Systems, IEEE Transactions on Engineering Management, Communications of theACM, IEEE Transactions on Education, IEEE Software and Healthcare Management Science. Dr. Sugumaran is the editor-in-chief of the International Journal of Intelligent Information Technologies. He is the Chair of the Intelligent Agent and Multi-Agent Systems mini-track for Americas Conference on Information Systems (AMCIS 1999 - 2015). He has served as the program co-chair for the International Conference on Applications of Natural Language to Information Systems (NLDB 2008 and NLDB 2013). He also regularly serves as a program committee member for many national and international conferences.