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Research notes

Acceptance and usage of a mobile information system in higher education: An empirical study with structural equation modeling

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ABSTRACT

Along with the rapid development of information and communication technologies (ICTSs), an astonishing number of mobile commerce applications have become available. Hence, the aim of this study is to investigate the use and acceptance of the Mobile Education Information System of Sakarya University (SABIS), a comprehensive information technology platform developed and implemented by Sakarya University Information Systems Department. Data were obtained from Sakarya University undergraduate students via a paper based survey to test the "Mobile Services Acceptance Model" using Structural Equation Model. Findings from 227 management undergraduate students indicated that the trust is important factor for predicting intention to use, yet the personal characteristics, perceived ease of use, and perceived usefulness do not have a meaningful effect on user intentions to adopt mobile SABIS. Results also showed a strong exogenous role of context and a positive strong relationship among perceived ease of use, perceived usefulness and trust to intentions to use in our theoretical framework.

1. Introduction

In our lives today, information and communication technologies (ICTs) have become much more indispensable and humanity has changed to keep pace with change. Although developing a new technology is a crucial process on its own, appreciation and usage of technology are also critical. Information technology usage has been a key dependent variable in Management Information Systems (MIS) research for many years, yet the factors affecting the usage and acceptance intentions of users are still questioned (Akbar, 2013; Bogart & Wichadee, 2015; Davis, 1989, 1993; Hew, Lee, Ooi, & Wei, 2015; Karahanna, Straub, & Chervany, 1999; Moore & Benbasat, 1996; Oye, Iahad, & Ab.Rahim, 2014; Park, 2009; Taylor & Todd, 1995; Venkatesh, Thong, & Xu, 2012). New technologies also provide new opportunities and adoption and acceptance of these new promising technologies have become a significant problem for both practitioners and academicians. Hence, it is an important issue to understand which factors contribute to users' intentions to use new mobile services.

The basic challenge is to understand how and why people adopt or do not adopt mobile services. Sarker and Wells (2003) claimed that there is not a clear understanding of the motivations and circumstances, which guide consumers to adopt and

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use mobile devices. In most cases, the successful diffusion of new mobile service is partially determined by willingness of users to adopt these services (Gao, Krogstie, & Siau, 2011). While there are some other factors like reference prices of the services offered (Blechar, Constantiou, & Damsgaard, 2006), standards, infrastructure and content (Barnes, 2002), compatibility, individual mobility and subjective norms (Schierz, Schilke, & Wirtz, 2010) seem to be affecting more to the users' intentions. Researchers are forced to investigate the determinants of user acceptance, because of enhancing applications, continuous emergence of new services and devices, existing competition, and inevitable developments in technology. Only a few studies addressed the acceptance of mobile services, while there has been a great deal of research on mobile services development (Conti, Militello, Sorbello, & Vitabile, 2009; Julien & Roman, 2006; Safar, Sawwan, Taha, & Al-Fadhli, 2009) and mobile and wireless networks (Durresi & Denko, 2009; You & Hara, 2010). Few studies have investigated the potential factors affecting the user adoption of mobile services (Gao et al., 2011). In this context, Gao, Krogstie, and Gransæther (2008) offered a new mobile services acceptance model by using existing technology acceptance framework by integrating new theoretical constructs. The new constructs offered in their study are namely personal initiative and characteristics, trust and context. Their model also includes traditional constructs like perceived ease of use, perceived usefulness, and intention to use. Their model based on Technology Acceptance Model (TAM) and it is augmented with other factors.

This study is among the first to study mobile services acceptance in higher education in a developing country context. The main objective of this work is to achieve a better understanding of factors influencing the adoption of mobile applications. In this study, a mobile services acceptance model (Gao et al., 2008) based on Technology Acceptance Theory is used to investigate the degree of acceptance and adoption of Sakarya University Information System's (SABIS) among the undergraduate management students. Sakarya University is the only higher education institution in Turkey that has won the "Continuity of Excellence Prize and European Foundation for Quality Management (EFQM)" and the first university with a "Quality Management Certification ISO 9001:2001" in the country.

Approximately 86,000 students study at Sakarya University as vocational school students, undergraduate and graduate students, and in distance education. The university has its own education management information system (EMIS) called SABIS. Detailed information of SABIS will be discussed in the next section in terms of how it could enhance student learning and instructor teaching capacity.

The paper is organized accordingly; a research background with a brief overview of general technology acceptance models is presented first. Detailed information about mobile application adoption and usage in the universities is presented next, followed by research model and hypotheses, methodology, theory testing and results, implications, limitations, conclusions, and recommendations.

2. Literature review

2.1. Technology acceptance models and mobile services acceptance model

User adoption of technology and critical factors are included in several areas of research, including marketing (Carlsson, Carlsson, Hyvönen, Puhakainen, & Walden, 2006; Schierz et al., 2010; Wang & Li, 2012), mobile services usage (Kargin & Basoglu, 2007; Yang, 2010; Zhou, 2011), and instant messaging (Hsu, Lu, & Hsu, 2007; Lu, Deng, & Wang, 2010). Various technology acceptance models and theories have been suggested in the literature. For an understanding of the existing work in this subject, a review of some related and underlying models are discussed below.

Several theoretical models have been developed to test the users' acceptance behavior. Among them, the Technology Acceptance Model (TAM) (Davis, 1989), an extension of the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), is widely applied and empirically tested in MIS research. TAM is one of the most widely used models due to its understandability and simplicity (Legris, Ingham, & Collerette, 2003). TAM predicts user acceptance of a technology based upon estimation of three core constructs: perceived usefulness (PU), perceived ease of use (PeU), and behavioral intention (BI); however, the major constructs of TAM cannot fully reflect the specific influences of technological and usage-context factors that may influence users' acceptance.

As a consequence, two other models have been incorporated. The first is the Extended Technology Acceptance Model (TAM2) (Venkatesh & Davis, 2000) which includes social influence processes (subjective norm, voluntarism, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and PeU). The second is Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003) based on studies of eight prominent information system adoption models including TAM. However, gathering the eight different models together has increased the UTAUT's complexity.

Innovation Diffusion Theory (IDT) is another well-known theory proposed by Rogers (1995). In recent decades, IDT has been widely used by information system researchers to predict the implementation of new technological innovations and how certain variables interact with one another. Previous research (Taylor & Todd, 1995) identifies the similarity between the constructs of TAM and IDT. Two constructs in IDT (relative advantage and complexity) seem to be the same as perceived usefulness and perceived ease of use in TAM, respectively. However, little research has been done on applying IDT to the domain of mobile services (Gao et al., 2011).

In this study, the Mobile Services Acceptance Model was used to determine the factors that affect the adoption and the usage of a Turkish education management information system on a mobile platform. While our research model is based on TAM (perceived ease of use, perceived usefulness), it consists of additional constructs, such as trust, context, personal

initiative, and individual characteristics. This model was originally proposed by Gao et al. (2008) but has not been used widely in the literature. Rather than using traditional models, such as TAM, TAM2, and IDT, we prefer to use a new model specifically developed to measure mobile service acceptance. Detailed information about this research model is outlined in the next section.

The existing literature on mobile systems acceptance largely relies on the seminal research papers on technology acceptance and usage. Our research model incorporates three less studied construct (trust, context and personal initiative and characteristics) in the acceptance of mobile services with a developing country data. Although mobile learning has been studied to a large extend, mobile educational services acceptance studies in developing countries, especially the ones carried out in educational settings are quite limited.

2.2. Adoption and usage of mobile services in education

The widespread use of mobile phone technologies in place of personal computers can be clearly seen across all phases of our lives, including among university students. Such widespread use may provide broad opportunities for institutions and businesses alike in applying the technology for commercial as well as for educational purposes. Carlsson et al. (2006) have stated that the adoption of mobile services has not progressed as expected because of some technical failures like disconnection and lack of hardware requirements, resistance to technology and other individual reasons like economic weakness. However, this statement is not totally accurate, especially for university students.

Studies of the acceptance and use of mobile information systems in education suggest that the technology is widely used, among majority of college students, who rely on the technology in a variety of ways (Irby & Strong, 2015). Park (2011) argued that the ubiquity of mobile devices allows educational professionals to use it in a variety of instructional settings. Trebbi (2011) considered the influence of information technology on educational practices as creating a new frontier for learning, with novel roles for teachers and students. Demirbilek (2010) suggested that the growing nature of mobile devices in educational settings has created an urgent need to examine how educators perceive the use of mobile technology within their teaching portfolios. Thornton and Houser (2005) surveyed students using mobile devices; he sent them a message about upcoming English lessons via the university's information system. Finally, the authors found that students who received e-mail via mobile devices learned more.

There is a trend towards more visually rich multi-channel information and independent of time/and location. Therefore, adoption of mobile devices and system in education has increased. Cheon, Lee, Crooks, and Song (2012) suggested that the increased use of mobile devices by students in higher education, compared to primary and secondary school students, may lead to quicker adoption of information systems in college and university settings. Responding to the trends, universities have developed new education management information systems also available for mobile phones.

Many academic institutions in Turkey have been providing various smart phone based services for both of their students and staff, such as Sakarya University's SABIS, Boğaziçi University's ÖBS, and Middle East Technical University's METU Portal. These services may offer many advantages to the students including choosing lessons, learning course content, and showing exam results, with access available any time and any place. In this study, SABIS, one of the most comprehensive EMIS in Turkey, was discussed and its user intention based critical factors examined.

SABIS was developed by Sakarya University and effectively in use since 2012. The main goal of this platform is to create a comparable, competitive, and transparent higher educational area, so that the quality of academic and administrative processes can be improved. SABIS consists of integrated modules and has two main services: open services available to everyone and private services allowed only for authorized users.

Schedules, publications and references, theses, and projects are offered as open services; the Staff Information System, Academic Information System, course registration statistics, additional course statistics, and other similar services are only offered for authorized users. Modules like the Student Information System, additional courses, and schedules were written on.NET platform with the help of entity framework and Model View Controller (MVC) architectural pattern via using C# programming language. On the other hand, Hypertext Preprocessor (PHP) was used in defining all departments' goals, objectives, program qualifications, and detailed course information, located in a unique web site called Information Package/Course Catalogue. Although SABIS was initiated in 2012, it is still under development, and the Sakarya University plans to make it as a model IS higher education platform for other universities. Number of universities in Turkey have already acquired and implemented SABIS as their primary EMIS in their institutions.

Thanks to this integrated system, students can access critical statistical information, (number of students according to the departments, course registration, and science labs), instructors' expertise area and their academic activities, ongoing projects, and other educational information. They can check their courses, materials, exams, grades, and announcements to arrange their schedules much more effectively. They can also submit complaints via the system and receive a reply. Because all exam notes have to be entered into the system in a timely manner by the instructors, students prepare for the next exam aware of their grade status immediately. Using SABIS, their schedules can be planned and easily operative. Students also take the advantage of alumni modules of SABIS. They can find suitable internship and job opportunities. This proves an important aspect of lifelong learning and education for all universities and a clear advantage to Sakarya University students.

Instructors can open virtual classes, download the course materials, evaluate the homework and get the students' profiles from the system. During the class, they can use the online roll call module. Faculty members can upload documents, homework, notes to the systems and also now accept and grade homework via SABIS. Another frequently used system is an

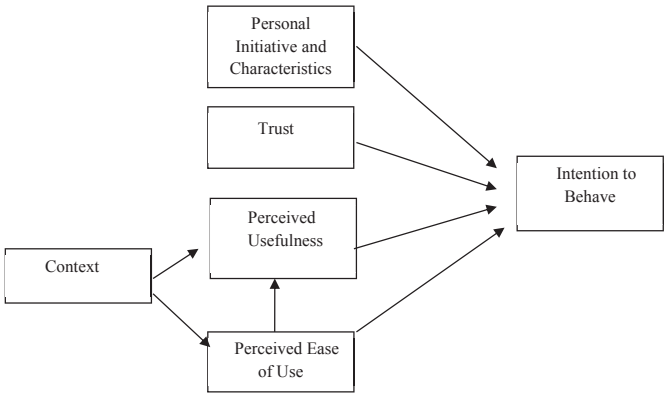

Fig. 1. Mobile services Acceptance model (Gao et al., 2008).

advisor management module that enables faculty members to manage students who are advised by them. University members can also have access to financial and payroll information and can see their salaries and all deductions and additions within the last one year period.

From the perspective of university administration, the system provides the information required to manage the university effectively. Ümit Kocabıçak, Vice President of Sakarya University, is responsible with SABIS development and implementation is quite pleased with the system, indicating, "I can see who will retire next month or the other month and who will need to be promoted in coming months right on my desktop with couple of clicks on SABIS. Also I can see information related with classes, opened or not opened, the names of faculty teaching them, and the number of enrollments as reports with SABIS".[1]

The use of ICTs in educational management has rapidly increased due to its efficiency and effectiveness. Instead of using different modules, such as Academic Information Systems, Student Information Systems, and School Management Systems, universities have started to gather them into the one system which is generally known as EMIS. The more frequently that universities handle and use their data both administrative and teaching/learning purposes, the better the ability of the university to manage and encourage lifelong learning.

SABIS now can offer modules to format online education courses and accept as well as grade home works, Projects and other course related tasks via online modules. Hence, SABIS's endeavor to become full scale mobile online teaching, learning and education administrative software has been taken to the next step. Mobile technologies that are featured in SABIS can provide timely and active acquisition of knowledge through the teaching materials exchange and provides direct and indirect educational benefits (Shin & Kang, 2015). As today's higher education students are surrounded by mobile equipment, it would be wise to approach mobile teaching and learning systems as well as education administrative/management systems under one umbrella. This is exactly what Sakarya University is trying to achieve. Barhoumi (2015) argued that learning activities supported by online learning tools are providing the most effective teaching and learning environments in higher education. Instructors utilizing online learning methods can achieve creative use of Internet technology based on mobile learning activities and can facilitate effective knowledge sharing among students.

Mobile educational services can play significant support role in formal educational systems with their important added benefits. Efficient acceptance and usage of mobile educational services are strongly related with mobile learning utilization and acceptance by university students (Liu, Li, & Carlsson, 2010). Hence, decision makers at universities and colleges can manipulate the factors investigated in this research model to enhance their students' acceptance and usage of mobile learning and mobile services. This study also aims to outline unique attitudes and access behaviors to technology of Turkish higher education students by utilizing relatively new mobile services model proposed in the MIS literature.

3. Research model and hypotheses

The research model was developed by Gao et al. (2008), and is presented in Fig. 1. Context, trust, personal initiative and characteristics are incorporated into the tradition TAM model from the new and extended versions of TAM. This has created the "Mobile Services Acceptance Model," which we employed as our theoretical framework. The search model is specific to mobile applications development and used in only limited number of studies. SABIS has been recently implemented a mobile version of some of its major modules, we wonder which factors play significant roles in acceptance and usage of this new extension of SABIS. Below, we discuss the constructs of the model and provide the research hypotheses.

[1] Interview carried out with the vice president of the university who is also head of the SABIS development team in October 2015.

3.1. Context

Mobile technologies have changed the users' mode of operation; they have started to carry the devices in their pockets or handbags and use them almost everywhere. Therefore, Mallat, Rossi, Tuunainen, & Öörni (2009) assumed that the use context is an essential factor in affecting user acceptance of mobile systems. The term "context" has been extensively used in the research of mobile-related technology. Chen and Kotz (2000) stated that context is a mobile computing environment determining how an application is used or the location where the application is used According to Dey (2001), context can be defined as any information to describe the situation of an entity. An entity is a person, place, or object, considered relevant to the interaction between a user and an application. Kim, Kim, Lee, Chae, & Choi, (2002:132) defines mobile context as "any personal and environmental information that may influence the person when she/he is using mobile Internet."

Based on the context information, the user can decide whether the mobile applications are useful or easy to use. For example, if people were unable to access their desktop computer, they would perceive accessing the system via mobile devices as more useful, but not necessarily easy to use. Context has rarely been used in examining computing environments; hence, we have limited knowledge on its effects. Dey (2001) found its use to be very beneficial in his study. Greenberg (2001) argued that context is a dynamic construct; therefore, determining individuals' actions based on a specific context may be very difficult. On the other hand, context concerns the good design of interfaces, and we think that context is of critical importance in determining a particular system's success. Hence, we integrate context construct into our model, and we proposed a positive relationship with the major TAM constructs and let the analysis reveal the directions of the relationship. This leads to the following hypotheses:

H1. Context has a positive and direct effect on perceived usefulness.

H2. Context has a positive and direct effect on perceived ease of use.

3.2. Trust

The concept of trust has been studied in various disciplines ranging from business to psychology to medicine, and explanation of this construct differs across disciplines. Trust is most commonly defined as the belief in a person's competence to perform a specific task or expectancy that the promise of an individual can be relied upon (Morgan & Hunt, 1994). It has also been defined as a willingness to rely or to depend on an exchange partner (Kim, Ferrin, & Rao, 2008). Trust literature postulates the sequence of influence of trusting beliefs on attitude, intention, and behavior and has been extensively used in the IT literature to examine the impact of trust on behavioral intention towards e-technologies (Gefen, Karahanna, & Straub, 2003; Yousafzai, Pallister, & Foxall, 2005). User trust is crucial for the growth and success of mobile services adoption, because engendering trust is not only time consuming, but trust is also fragile and easily destroyed. The process of continuous trust development deserves special attention from researchers (Siau & Shen, 2003).

Lack of trust is a barrier to the adoption of internet based services. Cho, Kwon, and Lee (2007) indicated that the trust is much more complicated in mobile commerce than in traditional commerce. Researchers have shown that trust is a critical factor in explaining users' acceptance of mobile services. Blank and Dutton (2012), Lee and Song (2013), Wang, Lin, and Luarn (2006), Wei, Marthandan, Chong, Ooi, and Arumugam (2009) and many other researchers directly addressed the impact of trust on internet commerce and found that trust cannot be ignored in examining mobile service adoption (Zhang, Zhu, & Liu, 2012). Many factors may influence people's trust in mobile services, such as the ability to control privacy settings, information degree, and perceived transaction security; therefore, developers and providers (the university management in our case) should cultivate user trust (the students and instructors, in our case) in mobile services by keeping their promises and commitments, specifically by ensuring that their services are conducted in line with user needs and expectations.

The role of mobile services user trust has been identified as critical, directly affecting users' intention to adopt, which suggests the importance of trust with regard to the intention to adopt or use technology. This leads to Hypothesis 4.

H4. Trust positively influences intention to use.

3.3. Personal initiative and characteristics

Personal initiative and characteristics vary from person to person depending on numerous factors, including their educational background, gender, age, interest to learn, and openness to experience new things (Gao, Ganapathy, Gopalakrishnan, & Gopalakrishnan, 2012). Some people want to adhere to existing technologies. No matter how patiently persuaded to try out the new technology, they will always say 'no' (Gao, 2011). In the short term, individual characteristics indicate whether he/she is willing to use the new service. Hence, it is not logical to expect someone without a technological background to adopt new devices.

Personal initiative is users' willingness to try out new applications and personal characteristics that are individuals' opinions of their perceived capabilities to use the new systems (Gao et al., 2008). Individuals' willingness, desires, needs, and positive perceptions play important roles in technology adoption. All questions that are composed of the personal initiative

and characteristics scale are positively notated items that would include personal joy, capabilities, being pioneer, advantageous, and usefulness of mobile systems use. Hence, they are aggregated under one theoretical construct.

In our study, personal initiative and characteristics are assumed to directly affect behavioral intentions. This leads to Hypothesis 5.

H5. Personal initiative and characteristics have a positive effect on intention to use.

3.4. Perceived usefulness

Perceived usefulness originally refers to job-related productivity, performance, and effectiveness (Davis, 1989). This construct has been found important in e-service context such as e-commerce (Gefen et al., 2003; Pavlou, 2003), mobile payment service (Chandra, Srivastava, & Theng, 2010), online banking (Bhattacherjee, 2001), health information system (Mou & Cohen, 2014) and also as relevant to the dynamic study of system usage (Bhattacherjee & Premkumar, 2004). By adding this model into the TAM, it is assumed that perceived usefulness directly affects the behavioral intention (Gao et al., 2008). Therefore, we suggest the following hypothesis:

H6. Perceived usefulness positively affects intention to use.

3.5. Perceived ease of use

Perceived ease of use (PeU) refers to the degree to which a person judges that using a particular system will require little or no effort (Davis, 1989). Chau (1996) found that PeU is the most influential determinant of software acceptance. Igbaria, Zinatelli, Cragg, and Cavaye (1997) stated that PeU is a dominant factor explaining perceived usefulness as well as system use. PeU is more salient in the early stages of new technology use; once an individual is familiar with new technologies; the use of new technology becomes easy, which has a positive effect on PeU of the technology (Marchewka & Liu, 2007). This leads to Hypotheses 3 and 7:

H3. Perceived ease of use positively affects perceived usefulness.

H7. Perceived ease of use positively influences intention to use.

3.6. Behavioral intention

Behavioral Intention refers to personal willingness or likelihood of someone to engage a particular behavior (Fishbein & Ajzen, 1975). Ajzen (1991) argues that Behavioral Intention reflects how much effort a person is willing to devote to performing a particular behavior. Behavioral intention is the most proximate predictor of actual behavior. Behavioral intention is based on personal initiative and characteristics, trust, perceived usefulness, and perceived ease of use.

4. Research methodology

4.1. Structural equation modeling (SEM)

In the social sciences, causal models arouse interest because of their ability to explain theoretical relationships among variables. Since these models usually use concepts that are intangible (George & Kaplan, 1998), researchers associate observed variables with these hypothetical constructs, which are called latent variables (MacLean & Gray, 1998). Structural equation modeling (SEM) is an important tool used to reveal linear relationships and effects among observed and latent variables (MacCallum & Austin, 2000).

In this study, a structural equation modeling analysis was carried out to examine the Mobile SABIS Acceptance Model and our six latent variables within their casual structure, as can be seen in Fig. 2. Three of our exogenous latent variables are trust (B), personal initiative and characteristics (C) and context (D). The endogenous variables are perceived ease of use (A), perceived usefulness (E) and intention to use (F). Observed variables have been used as proxies for these constructs.

4.2. Data source and descriptive statistics

This research began in the summer of 2014 and data collection finalized before the end of 2014. The participants were chosen from undergraduate students of Sakarya University School of Management. The survey was administered using a paper instrument during face to face interactions with students in the fall semester of 2014. Participation to the survey was completely voluntary.

Since the participation of academic and administrative staff to our survey was very minimal; they were excluded. Totally 227 undergraduate students have participated to the study and respondents were selected based on the convenience sampling method, where researchers visited all of the available classes during the semester with permission of their instructors.

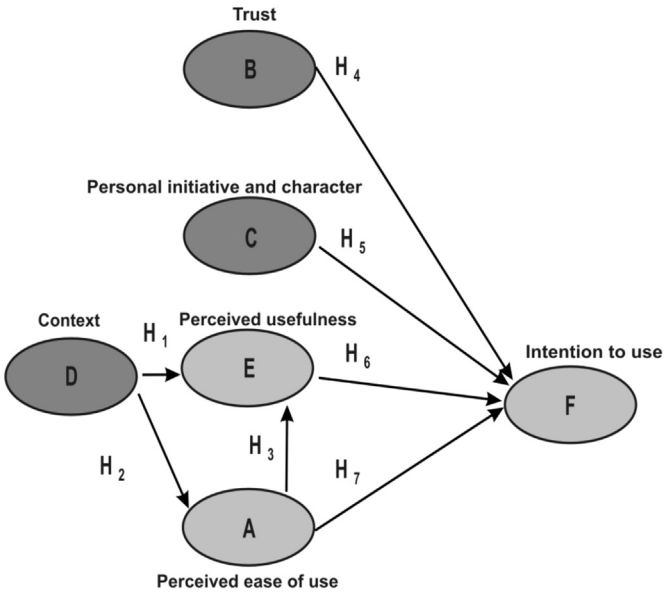

Fig. 2. Mobile SABIS Acceptance model.

Since our major purpose to assess students' acceptance and adoption of SABIS, our focus was only students in this research. Hence the participants are mostly youngsters that over 95% of them are between the ages of 17 and 24.

Participants who have not heard about SABIS or have not used it were not included into the study, since our aim was to investigate the adoption and usage tendencies and assess the socio-psychological factors behind the adoption of this major education management information system in one of the largest Turkish higher education institution. All 227 participants indicated that they were aware about the system and used the system. About 10 percent of participants said that they do not have a smart phone, but gain access to the system from a friend's phone or via a tablet.

The survey instrument consists of two parts. While Table 1 is the first part of the instrument and includes demographic variables, such as gender, age, income level, whether they have smart phone and, if they do, years of usage, type of operating system of their smart phones, and some usage characteristics of the mobile SABIS, the second part of the survey is presented in Appendix 1 which contains the scales of six latent constructs. These scales are formatted in 5 point Likert Scale as 1 meaning 'Strongly Disagree' and 5 meaning 'Strongly Agree'.

5. Theory testing and results

5.1. Reliability and confirmatory analysis

All the latent variables in the research model were used and tested in the literature previously. Observed variables are represented by 33 questions that attempt to capture the six latent variables. Scale reliability is measured by Cronbach's alpha. Table 2 shows the Cronbach's alpha reliabilities for each theoretical constructs, the sources where they were adopted, and number of items in each scale.

As can be seen in Table 2, all Cronbach's alpha values for the variables representing the studied concepts are higher than 0.9, except for the concept of personal initiative and characteristics. These values are higher than the critical values of Cronbach's alpha determined by Nunnally (1978). However, Hatcher (1994) suggested that Cronbach's alpha values must be greater than 0.8. The scales measuring the latent variables are considered to be credible, since our all alpha values are higher than 0.8. All corrected item and total correlation values are greater than 0.2, so none of the questions were deleted.

Confirmatory Factor Analysis (CFA) is used to determine how well the questions, which are the latent variables indicators, can represent the whole model. It compares two different structures: a theoretical one and one created via data for testing hypotheses between the latent and model variables (Bryman & Cramer, 2005). To refine the measures, we conducted a confirmatory analysis to determine the validity and reliability of our measures. Results are demonstrated in Table 3.

As shown in Table 3, all standardized loadings for the Perceived Ease of Use scale are higher than 0.8 and error variances are between 0.16 and 0.29. Standardized factor loadings for the trust scale range from 0.88 to over 0.96. Most of the factor loadings are above 0.90.

Error variances for the trust scale range from 0.07 to 0.23. Personal initiative and characteristics scale factor loadings range between 0.45 and 0.97, and error variances range from 0.06 to 0.80. Standardized loadings for context scale are between 0.69

Table 1
Characteristics of respondents.

Characteristics	N	(%)
Gender		
Male	111	48.9
Female	116	51.1
Income		
<1000	177	78.3
1000–2000	35	15.5
2001–3000	10	4.4
>3000	4	1.8
Do you have a smartphone?		
Yes	204	89.9
No	23	10.1
How many years do you use a smartphone?		
None	22	9.7
< 1 year	71	31.3
Between 1 and 3	92	40.5
Between 3 and 5	28	12.3
> 5 year	14	6.2
Which kind of operating system does your smart phone have?		
Apple IOS	47	20.7
Android	153	67.4
Windows	3	1.3
Blackberry	2	0.9
Don't Know or Don't have	22	9.7
How much do you connect to the internet (daily)?		
< 1 h	22	8.8
Between 1 and 2 h	55	24.2
Between 2 and 5 h	91	40.1
Between 5 and 10 h	45	19.8
> 10 h	16	7.0
Do you know SABIS?		
Yes	227	100.0
Have you ever used Mobile SABIS?		
Yes	227	100.0

Table 2
Source of Subscales and Cronbach's alpha Values.

Scale	Number of questions	Source	Cronbach's alpha
Context	7	Dey (2001)	0.940
Personal initiative and characteristics	7	Gao et al. (2008)	0.875
Trust	7	Gao et al. (2008)	0.978
Perceived usefulness	5	Davis (1989)	0.947
Perceived ease of use	5	Davis (1989)	0.915
Intention to use	2	Fishbein and Ajzen (1975); Davis (1989)	0.922

Table 3
Standardized (Std.) Loadings and t-values for Subscale's Confirmatory Factor Analysis.

Factors	Observed Variables	Std. Loadings	t-values	Factors	Observed Variables	Std. Loadings	t-values
Perceived ease of use (A)	PeU1	0.85	15.68	Perceived usefulness (E)	PU1	0.74	12.60
	PeU2	0.84	15.49		PU2	0.81	14.39
	PeU3	0.91	17.65		PU3	0.90	17.01
	PeU4	0.91	17.68		PU4	0.88	16.34
	PeU5	0.92	17.88		PU5	0.82	14.72
Trust (B)	T1	0.88	16.76		C1	0.88	16.64
	T2	0.89	17.31		C2	0.69	11.78
	T3	0.94	18.83	Context (D)	C3	0.87	16.44
	T4	0.94	18.81		C4	0.87	16.36
	T5	0.96	19.73		C5	0.92	18.12
	T6	0.94	18.71		C6	0.88	16.60
	T7	0.96	19.64		C7	0.74	12.73
Personal initiative and character (C)	PIC1	0.72	12.38	Intention to use (F) [a]			
	PIC2	0.46	7.24				
	PIC3	0.45	7.04				
	PIC4	0.72	12.34				
	PIC5	0.66	11.03				
	PIC6	0.97	19.81				
	PIC7	0.94	18.65				

[a] CFA is not suitable for two manifest variables.

Table 4
Goodness of fit indices of confirmatory factor analysis for subscales.

Goodness of fit Indices	Factors				
	A	B	C	D	E
GFI	0.88	0.92	0.83	0.92	0.95
AGFI	0.65	0.84	0.67	0.83	0.85
SRMR	0.03	0.01	0.11	0.03	0.03
RMSEA	0.25	0.13	0.21	0.14	0.15
p value for test of close fit (*RMSEA* < 0.05)	0.00	0.00	0.00	0.00	0.00
NNFI	0.91	0.98	0.86	0.96	0.95
CFI	0.95	0.99	0.91	0.97	0.98

Table 5
Fit indices for the measurement model and structural model.

Fit statistics	Decision criteria (source)	Result
χ2/degrees of freedom	<3.00 (Bollen, 1989)	3.0002
GFI	>0.9 (Schermelleh-Engel & Moosbrugger, 2003)	0.72
AGFI	>0.85(Schermelleh-Engel& Moosbrugger, 2003)	0.68
SRMR	<0.08 (Hu & Bentler, 1999)	0.08
RMSEA	<0.10 (Tabachnik & Fidell, 2007)	0.094
p value for RMSE<0.05	<0.05 (Bentler, 1990)	0.00
NNFI	>0.80 (Hooper, Coughlan, & Mullen, 2008)	0.98
CFI	>0.95 (Hu & Bentler, 1999)	0.98

and 0.92, and error variances range from 0.15 to 0.52. Factor loadings for perceived usefulness are between 0.74 and 0.90, and error variances have values from 0.19 to 0.46.

Therefore, Perceived Ease of Use (A), Trust (B), Personal Initiative and Characteristics (C), Context (D) and Perceived Usefulness (E) scales have formed one factorial structure (all t values are large). Confirmatory Factor Analysis fit indices values for theoretical scales are presented in Table 4.

All the goodness of fit indices are given in Table 5. GFI value of scale C and A are lower than 0.9. AGFI values of scale A and C are lower than 0.8. For SRMR; only the value of scale C are greater than 0.08. All RMSEA values are higher than 0.10. NNFI values of all scales are suitable. Only the CFI value of the scale of C is less than 0.95. All threshold values for fit indices are listed in Table 6.

5.2. Theoretical model testing with structural equation modeling

For testing the Mobile Services Acceptance Model via the collected data, SEM analysis was used. In the theoretical structure of our study, totally six latent variables were cooperated; perceived ease of use (A), trust (B), personal initiative and characteristics (C), context (D), perceived usefulness (E) and intention to use (F). Using the calculated path coefficients, hypotheses were tested and relationships between latent variables were explained. Statistically meaningful relationships between latent variables were demonstrated by significant path coefficients. Maximum Likelihood Estimation was used for prediction method in SEM.

Standardized path coefficients for the latent variables and factors loadings with error variances of observed variables can be seen in Fig. 3. The highest error variance is 0.79, while factor loadings range between 0.46 and 0.96. Due to the lowest t value being 7.13, the observed variables in Mobile Services Acceptance Model are confirmed as the indicators of latent variables ($p > 0.05$). Goodness of fit indices were investigated to demonstrate that collected data is representative of the model. Table 5 presents the overall model fit indices values.

Table 6
Path co-efficient and t-values for structural model.

Hypotheses	Causality	Path coefficients	t values
H1	Context has a positive direct effect on the perceived usefulness.	0.56	7.64
H2	Context has a positive direct effect on perceived ease of use.	0.77	11.68
H3	Perceived ease of use positively affects the perceived usefulness.	0.31	4.11
H4	Trust positively influences the intention to use.	0.60	7.05
H5	Personal initiative and characteristics have a positive effect on the intention to use.	0.01	0.11[a]
H6	Perceived usefulness positively affects the intention to use.	0.02	0.19[a]
H7	Perceived ease of use positively influences the intention to use.	0.11	1.25[a]

[a] Hypothesis had not been confirmed.

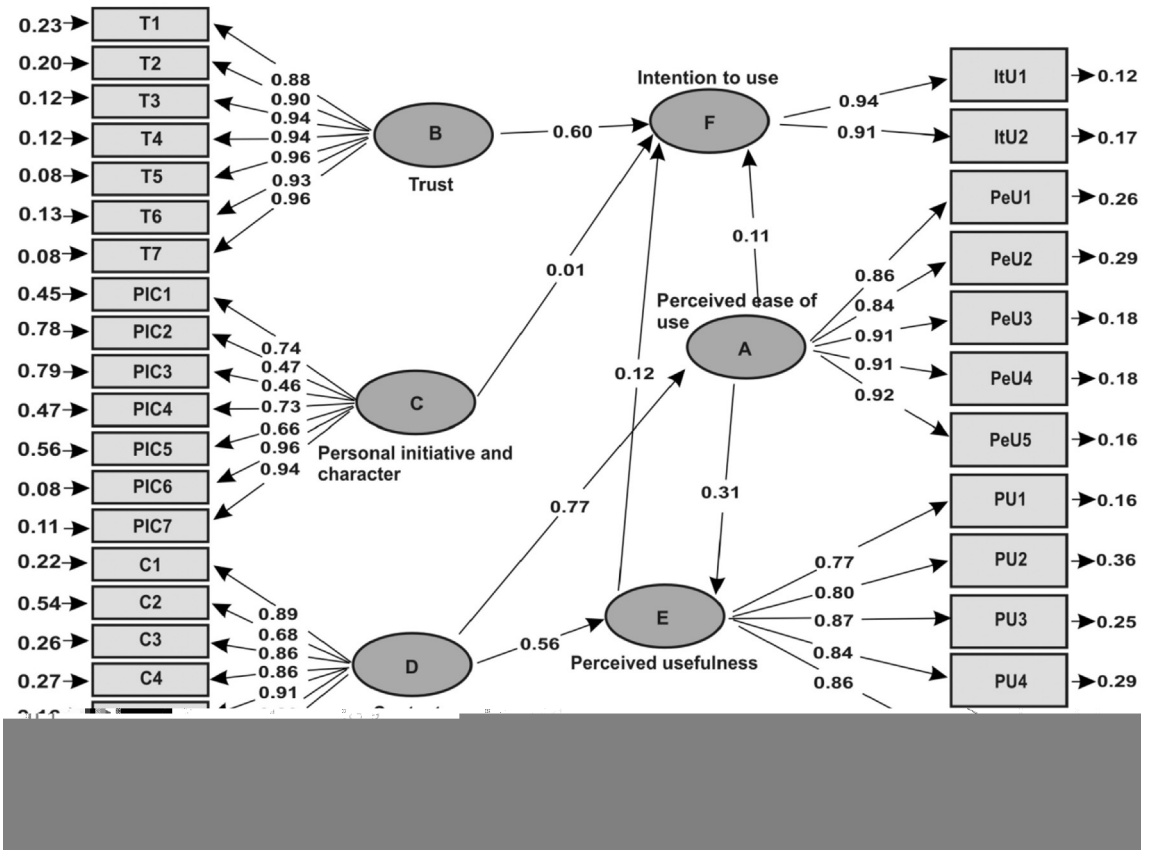

Fig. 3. Result of the research model.

Chi-square is the first value must be analyzed to measure the consistency between observed and estimated covariance (Hu & Bentler, 1999). The chi-square value (χ^2) is 1455.11 ($p < 0.05$), which is expected in large sample sizes (Çokluk, Şekercioğlu, & Büyüköztürk, 2010). As recommended in the literature, relative chi square value (normed chi-square value obtained degrees of freedom value divided by chi-square) is taken into account instead of chi-square value alone (Hair, Black, Babin, & Anderson, 2010). Relative chi-square is calculated around 3, demonstrating that collected data create a reasonably adequate model fit (Wheaton, Muthen, Alwin, & Summers, 1977). Similar to chi square statistics, relative chi square is also influenced largely by sample size and does not have an acceptable limit value (Kline, 2011). Hence relative chi square value should also be approached with caution and other fit indices should be considered for overall decision as well.

GFI is 0.72 and AGFI is 0.68, therefore, they are not within acceptable limits. GFI and AGFI are largely affected by sample size (Fan & Sivo, 2005); therefore, use of these fit indexes is not recommended (Sharma, Mukherjee, Kumar, & Dillon, 2005). Other goodness of fit indices are reasonable, according to decision criteria. SRMR is close to 0.08, RMSEA is lower than 0.10, NNFI is greater than 0.80 and CFI is greater than 0.95. Therefore, SEM analysis to a large extend verifies our hypothetical model.

5.3. Results of path analysis

The data provided support for the hypotheses to a large extent. Trust had a direct positive relationship on use intentions with a standardized path coefficient of 0.60. This provided support for Hypothesis H4. A surprising result was that the direct path between perceived usefulness and usage intention was insignificant, as was the perceived ease of use effect on intention to use. Therefore, Hypothesis H6 and H7 are rejected. Instead, the effect of context on PU and PeU was found significant, with path coefficients of 0.56 and 0.77. Hypotheses H1 and H2 were thus supported. As expected, H3 was supported, which means that PeU had a direct effect on PU. Finally, no direct positive effect was found between personal initiative and characteristics and intention to use; therefore, H5 was rejected. The results are shown in Table 6.

6. Conclusions and recommendations

Higher education institutions face more challenges and complex issues from increasing number of enrollments to the infrastructure limitations in accommodating students and classes (Dobre, 2015). To overcome these immediate concerns

faced by universities, ICTs have become one of the most decisive instruments during the past two decades. Instead of managing the complicated learning and teaching process using conventional methods, university administrators have started to plan and evaluate using integrated systems called education management information system (EMIS).

EMIS are used by universities to support a wide range of administrative, teaching, and learning activities, including attendance monitoring, assessment records, reporting, financial management, preparing course materials, and resource and staff allocations (Shah, 2014). Universities developed these systems to enhance process efficiency and to manage distribution and allocation of educational resources. There is no doubt that EMIS provides an advantage to students, staff, faulty, and university administration. Unless the factors affecting the usage and the adoption of the system are well examined within each university context, resistance may cause a system failure. The purpose of this study was to investigate the socio-psychological factors underlying the acceptance and usage of one EMIS called SABIS, developed by Sakarya University and currently used by some other universities in Turkey. The survey was based on major technology acceptance literature and administered to university students. In addition to traditional constructs of technology acceptance such as perceive ease of use and perceived usefulness, other more specific factors (such as trust and personal initiative and characteristics) were also incorporated into the research model.

Analysis confirmed four of our research hypotheses. The context of applications has a significant positive effect on perceived ease of use and usefulness, and perceived ease of use also has a significant positive effect on perceived usefulness. This supports most findings within the Management Information Systems literature. Finally, trust has a significant positive and direct relationship to intention to use. A statistically significant relationship was not found between (a) personal initiative and characteristics and intentions to use and (b) direct relationships to perceived usefulness and perceived ease of use to behavioral intentions. Our sample is composed of students, who tend to be very eager to use new technologies. They have grown up in the information age, where cell phones and computers are part of life. Hence, it is understandable that perceived ease of use would not have a significant effect on behavioral intention.

The easiest way for students to learn their grades and assignments at Sakarya University is through SABIS, relieving them from going to the instructor or student offices. Hence, using SABIS in a way has become customary for many students and the university is continuously pushing more and more services online through SABIS. Moreover, most of the students have experienced with SABIS, so it is widely acknowledged that the system is essential and practical for the university. According to feedback received from open ended questions in the survey, failure to show grade averages and instructor resistance to download course materials are two notable inadequacies of SABIS.

Personal initiative and characteristics have not been found to significantly affect intention to use. Personal initiative and characteristics concept contained items that assess respondents' capabilities, enjoyment, being first adopter, and perceived advantage of using the system. Again, for young people, these factors clearly would not have important impacts on usıng the system. Our study indicated that context has a positive and directional effect on both usefulness and perceived ease of use.

Trust has a significant effect on behavioral intention. Hence, it is an important factor to consider in understanding information system acceptance and usage behavior. Only the School of Management students are included in our study; therefore, the results might not be generalizable to other departments or schools. Investigating faculty and administrative perceptions of SABIS usage and acceptance could reveal valuable results as well.

This study is among the first on Mobile Information Technology acceptance in Turkish context and it might provide useful guidance for both academicians and practitioners to reveal which socio psychological factors should be considered for mobile application acceptance. In the further studies, different determinants from different technology models and also different variables compatible with the society's culture can be selected and incorporated into the new models.

7. Implications

This study has both practical and academic implications. From the practitioner point of view, the results of this study can be used throughout the design and implementation process of EMISs to create a better information systems service. Moreover, understanding instructor and student perception and adoption of mobile services can result in designing better systems. Managers of educational institutions should investigate student acceptance of mobile services when creating course content for mobile devices (Iqbal & Qureshi, 2012). By better understanding socio-psychological and cultural factors behind technology adoption and use behavior, we can design better more efficient and high quality educational systems. Acceptance and usage of Mobile Educational Services and Systems can also lead the way of acceptance and adoption of mobile learning systems that can very much within the scope and interest of educational administrators in these days. Enhanced decision process of administrators of educational institution as a result of using better designed and functional EMIS could also be additional benefits of similar studies.

There are some theoretical implications on this paper as well. The research instrument developed, modified and administered in this study could help researchers to have an instrument with high reliability and validity. The researchers especially from developing countries could adopt the instrument and implement it in their institutions and carry out research related with implementation and adoption of new especially mobile education management systems.

Consequently, to implement better and comprehensive Education Management Information Systems (EMIS) like SABIS could help managers of higher education institutions to more effectively and efficiently manage their colleges. These systems

would provide an integrated and detailed view of all work processes and deliver vital, appropriate, and timely information to all level of management to improve their decision making process.

SABIS is not without its disadvantages. Existing literature on mobile education information systems acceptance largely argues that such systems can improve instructional processes significantly by assisting faculty members in managing their courses and better organizing the course content to engage students and these systems can also decrease course planning time and enhance course progress and process (Cigdem & Topcu, 2015; Mtebe, 2015; Wichadee, 2015). Yet, Gautreau (2011) has expressed that many faculty members are not motivated to use the system for a variety of reasons and they still continue to use traditional teaching and learning methods. Among the major reasons include the faculty members' lack of knowledge of using advance information technologies, their negative attitudes towards these systems and their lack of readiness to change as well as poor technical support provided by university administration. Acceptance and adoption of an EMIS among the faculty members have a significant importance, since their negative approaches could also affect students' effective use of these systems (Teo, 2009; Wang & Wang, 2009). Unless instructors encourage students, students cannot explore the full expected benefits of the system. Learners who more steadily use the system gain much more advantages (Filippidi, Tselios, & Komis, 2010; Jo, Kim, & Yoon, 2014).

The other issue needs to be addressed is about ethical problems. In SABIS, instructors are able to see students 'grade not only for their class, but also all other courses they have taken before. This authorization given to the instructors could cause some problems. For instance, once a student chooses the instructor's course, it can be seen that if she/he was successful in the previous classes taken, and prejudices towards the students may appear. However, instructors must evaluate students' success only based on their own class and students' previous failures should not negatively effect on instructor's perceptions. One last negative issue of SABIS could be that there are some students who are really in poor economic and financial status and they cannot effort to buy latest technologic gadgets. Hence, migrating all class related information and processes to SABIS can create some sort of disadvantage for these students, given their limited continuous access to SABIS. Like many other public university in a developing country, in Sakarya University public computer labs, although available, are limited in campus.

8. Limitations and future research

First, the findings of this study may only apply to Sakarya University's unique environment. The conclusions must be carefully evaluated before projecting these findings on another university setting, especially in other countries. Student characteristics in other universities or even other schools or departments may have very different results than the ones participated in this study.

However in this study, only the students' usage and adoption of SABIS have been examined, the acceptance and attitude of instructors towards using the mobile services must also be investigated if the university wants to build a successful and integrated electronic system (Uzunboylu & Özdamlı, 2011). Understanding these relationships may increase comprehension of mobile services acceptance and adoption among educators and students and offer some new insights to enhance student learning process.

Another limitation could be that the data was collected only from one higher education institution. A comparative study with other higher education institutions or even lower level institutions could provide further beneficial results. Barnett (2003) stated that higher education changes as society changes. Comparison with both developed and developing countries also may produce interesting results and surely enhance the existing literature on education management systems.

This study offers a fresh look to extended technology acceptance model for user adoption of mobile services. Although it focused primarily on the use and adoption of EMIS from the perspective of teaching and learning process, Demir (2006) states that few studies have been done on the use of them in educational management and their effects on the managers. This could be well a future topic of study.

The current study will shed light on usually less studied area of socio psychological factors reflecting mobile systems adoption and usage of college students in developing countries. Hence, the higher education institutions of both the public and private sectors can benefit from successful outcomes of this research. In developing countries, resources are quite limited and developing countries usually fall behind of developed countries in terms of adopting and using new technologies. Mobile educational systems are among the newly emerging ICTs in developed countries. Similar studies related with acceptance, adoption and usage of mobile educational systems in developing countries could provide very useful insights of utilizing quite limited resources in implementation process of such systems. Further similar studies can also enhance the research model by integrating other variables and seek to explain better mobile EMIS acceptance and usage. Intrinsic and extrinsic motivation could be one of the most promising constructs to be considered. Future studies could also examine the same concepts with participants that include students older than the traditional students (non-traditional students).

There are some theoretical implications as well. The research instrument developed, modified and administered in this study could provide a useful tool with high reliability and validity; especially in developing countries. This model proposed in this study can also shed light on the less studied area of socio-psychological factors affecting mobile systems adoption and usage of college students in public and private educational institutions.

Appendix 1. Instrument survey: an education management information system (SABIS-Sakarya University Information System)

Please use a few minutes to answer the following statements pertaining to the general conception of the SABIS service. All respondents remain anonymous.

Perceived usefulness (PU) perceived ease of use (PeU) trust (T) personal initiative and characteristics (PIC) context (C) intention to use (IU)	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree kesi
	1	2	3	4	5
PU1.Using the system would increase the efficiency of my daily work.					
PU2. The system would allow me to find rooms and buildings at Sakarya University.					
PU3. The system would make it easier to keep track of my weekly tasks.					
PU4. The system would allow me to better schedule my time.					
PU5. The system would be useful for me as a student/staff.					
PeU1. Learning to operate the system would easy for me.					
PeU2. I would easily find the information I am looking for using the system.					
PeU3. I would find the user interface of the system clear and intuitive.					
PeU4. I would find the system to be flexible to interact with.					
PeU5. I would find the system to easy to use.					
I could use the system …					
T1. If I have a clear conception of the functionality of the system					
T2. If the system provider is widely acknowledge (the university)					
T3. If the system protects the privacy of its users					
T4. If I feel confident that I can keep the system under control.					
T5. If I feel confident that the data returned by the system is reliable.					
T6. If I believe it is risk-free to use the system.					
T7. If it is safe to use the system.					
PIC1. I am capable of using the system.					
PIC2. I have fun using the system.					
PIC3. I prefer to be the first one using the system.					
PIC4. Using the system gives me an advantage over those who don't.					
PIC5. I would only use the system if it was available for me.					
PIC6. I find it rewarding to use the system.					
PIC7. Using the system is a good idea.					
I could use the system …					
C1. If I am being out of home or the office.					
C2. If most people around me are using the system.					
C3. If I had nice experience in using mobile services before.					
C4. If the university encourage students to use the system.					
C5. If the system was easy to obtain and install.					
C6. If it is meaningful/relevant to my daily tasks.					
C7. If I did not have Access to a desktop computer or laptop.					
IU1. Assuming I have access to the system, I intend to use it.					
IU2. Given that I have access to the system. I predict that I would use it.					

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