Information Technologies Pre-service Teachers' Acceptance of Tablet PCs as an Innovative Learning Tool[*]

Cem ÇUHADAR[a]

Trakya University

Abstract

The current study is aimed to determine if Turkish IT pre-service teachers' acceptance of tablet PCs is within the framework of the Technology Acceptance Model. The research was patterned as a phenomenological study which is among the qualitative research methods. Participants were eight pre-service teachers studying in Trakya University, Faculty of Education, Computer Education and Instructional Technologies Department during the 2011-2012 academic year. A semi-structured interview, an activity list for tablet PCs, the students' reflective journal and the researcher's reflective journal were used to collect the data. Research data were analyzed via content analysis. Findings showed that IT pre-service teachers have technology acceptance towards tablet PCs which in turn directs in a positive way their attitude and behavioral intention to use. Nonetheless, various challenges concerning the hardware, software and communication may have negative effects on IT pre-service teachers' technology acceptance of tablet PC.

Key Words

Mobile Learning, Reflective Journal Writing, Tablet PC, Teacher Education, Technology Acceptance, Technology Integration.

The use of a tablet PC as an innovative tool in teaching-learning processes has become increasingly widespread on the university level. Liaw, Hatala, and Huang (2010) report that the fast spread of the tablet PC and relevant technologies parallel to the rise in internet access options has altered the nature of higher education thoroughly. A set of studies focusing on the use of the tablet PC in the university has shown that such technologies have contributed positively to teaching-learning processes (Dickerson, Williams, & Browning, 2009; El-Gayar, Moran, & Hawkes, 2011; Li, Pow, Wong, & Fung, 2010; Steinweg, Williams, & Stapleton, 2010).

On one hand, Dickerson, Williams, and Browning (2009) describe learners of the modern age as advanced technology users. On the other hand, tablet PCs are a totally new concept for a majority of these users since they lack adequate experience with tablet PCs that they do not personally own. Based on this fact, Kyu (2011) claims that to promote this new technological tool- tablet PCs- a certain length of time should be spent to enable not only wider manufacturing of this electronic material but also to become familiarized with this new technology. Additionally, because of the high cost of their technical features and the limited software options

a **Cem ÇUHADAR. Ph.D.,** is an associate professor of Computer Education and Instructional Technologies. His research interests are m-learning, ICT in teacher education, Web based learning. *Correspondence:* Trakya University, Faculty of Education, Department of Computer Education and Instructional Technologies, Edirne, Turkey. Email: cemcuhadar@trakya.edu.tr

that are available to many fields and learning levels, the use of tablet PCs in instructional processes is rather ambiguous regardless of its positive expectations. Despite the fact that this ambiguity seems to stem from administrative, financial, technical assistance and substructure factors; the attitudes, skills, perceptions and expectations of pre-service teachers towards the use of tablet PCs as an innovative technology for both personal and instructional purposes have a leading characteristic that encircles and governs all the other parameters. El-Gayar et al. (2011) state that despite the presence of some studies investigating the use of the tablet PC in education, the number of literary studies focusing on general student acceptance is limited. Kukulska-Hulme and Shield (2008) report that the quantity of researchers investigating the use of mobile tools supporting pedagogical approaches is rather low. It is also emphasized that regardless of being an emerging and interesting technology, the number of studies underscoring the use and efficacy of tablet PCs in education is below expectations (El-Gayar et al., 2011; Kukulska-Hulme & Shield, 2008; Kyu, 2011; Steinweg, Williams, & Stapleton, 2010).

Parallel to the limited number of studies in relevant international literature, the practices and researches related to the use of tablet PCs for instructional purposes in Turkey are still in the start-up phase. In particular, with the implementation of the FATİH Project (Movement of Enhancing Opportunities and Improving Technology, abbreviated as FATİH), which is aimed towards generalizing the use of instructional technologies such as tablet PCs and smart boards in Turkish elementary and secondary educational institutions, there has been a recent climb in studies investigating the use of tablet PCs for instructional processes throughout Turkey. On the other hand, in some parts of these researches there are worthy criticisms addressing the use of tablet PCs in the field of education. For instance, Bozdoğan and Uzoğlu (2012) put forth that the use of tablet PCs in the field of education is quite a new concept for Turkey. Güven (2012) underlines that within the Turkish educational system, computer literacy levels of teachers and students to use innovative technologies such as tablet PCs is below standards. They also point out that the number of studies related to the advantages and contributions in terms of technical substructure and the science of education is insufficient. Çiftçi, Taşkaya, and Alemdar (2013) argue that the spread of the effective use of tablet PCs within the scope of the FATİH project throughout elementary education is inapplicable to a large extent. This is related to

the fact that teachers who are expected to use computers effectively lack adequate computer skills and they entertain negative attitudes towards the use of computers.

The agents that shall use tablet PCs actively in the teaching process are the teachers themselves. In a variety of education faculties in Turkey, there are several teacher-training programs designated to train teachers for employment in different stages and fields of education. Nonetheless, it is hardly feasible to argue that during pre-service training, pre-service teachers receive adequate knowledge on the use of innovative technologies, such as the tablet PC, for instructional purposes or gain a definite instructional perspective regarding the use of such technologies in classroom activities. It can thus be reasonably claimed that part of the challenges related to the use of technology in schools is linked to the fact that teachers possess insufficient levels of knowledge and experience on the use of technology. Concordantly, in 1998, Computer Education and Instructional Technologies Departments have been established with the aim of training Information Technologies (IT) teachers for elementary and secondary educational institutions in Turkey. IT Teachers are not only responsible for executing basic courses on the use of information and communication technologies but they also play a role as consultant in the integration of technology within their assigned schools. Besides, the positive attitude of IT pre-service teachers towards the use of innovative technologies such as tablet PC shall at the same time be useful in shaping a positive attitude towards the effective use of these technologies in the workforce upon graduation. Within this context, present research aims to demonstrate on personal, instructional and technical grounds the acceptance of IT pre-service teachers who are not only active technology users but also potential instructors in the Turkish educational system. It is also geared towards supporting the use of innovative technologies such as tablet PCs within the framework of variables such as perceived usefulness and perceived ease of use.

Literature Review

Acceptance models that aim to manifest the acceptance level of technology in education are useful tools in understanding and directing technological innovations (El-Gayar et al., 2011). One of these models, Technology Acceptance Model is an approach developed by Davis (1986) in order to demonstrate technology use behaviors
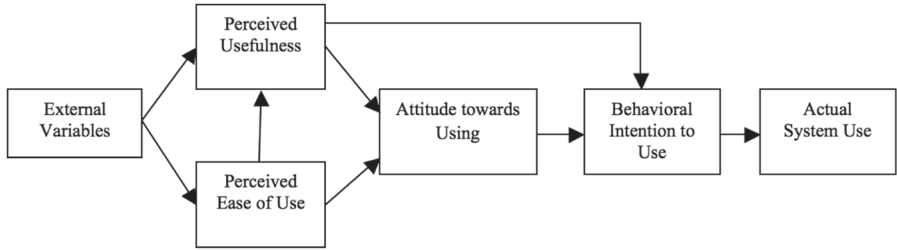
Figure 1.
Technology Acceptance Model (Davis, Bagozzi, & Warshaw, 1989)

of individuals and clarify determinant factors underlying technology acceptance (Figure 1). This model structures state of technology acceptance on the basis of two main variables: namely, perceived usefulness and perceived ease of use.

Perceived usefulness refers to the conviction of individuals whether applied practice shall or shall not enhance their work performance. Perceived ease of use implies whether the practice expected to be useful shall be at the same time easy to use (Davis, 1989; Davis et al., 1989). With the enforcement of a set of variables considered to be effective in the usefulness and ease of use, it is witnessed that the Technology Acceptance Model is enlarged and technological perceptions of people are attempted to be enlightened. In relevant literature there are various studies focusing on the use and acceptance of tablet PC technology. To illustrate, El-Gayar and Moran (2007) report that compared to perceived ease of use, perceived usefulness provides greater effects. However it is also noted that both variables are significant predictors of the attitudes of students towards tablet PC use. Echoing this assertion, El-Gayar et al. (2011) also underscore that students' perception of ease of use towards tablet PCs has a positive effect on the perception of usefulness and they also claim that this condition is a significant factor influential in the behavioral intention to use. In a different study it has been reported that perceived usefulness renders an effect on the attitude towards the computer and computer self-efficacy has a direct effect on the intention to use technology. On the other hand, perceived ease of use, facilitating conditions and technological complexity have indirect effects on behavioral intention (Teo, 2009).

On the basis of usefulness and ease of use perceptions, while explaining technology acceptance of tablet PCs, factors such as personal differences, technological substructure, specific contexts of educational practices and potential

instructional factors that might affect these variables should also be taken into account. To say this another way, in another saying on the basis of several factors such as school substructure, technical assistance and curriculum it can be argued that the potential benefits of tablet PCs are linked with the objectives of use (Becta, 2005). To start with, within instructional context, it is detected that tablet PCs on the whole bear qualities that support teaching-learning processes. Tablet PCs provide to teachers and students facilities that can improve in-class collaboration (Gill, 2007). In-class teaching practices can be listed thusly: improving note-taking and course-material collection skills (Enriquez, 2010), boosting motivation (Becta, 2005; Dickerson et al., 2009; Li et al., 2010), reaching knowledge via different tools, processing and sharing (Amelink, Scales, & Tront, 2012), establishing interaction between teacher and students (Alvarez, Brown, & Nussbaum, 2011; Chen & Sager, 2011; Liaw et al., 2010) and contributions of tablet PCs to learning environments. Additionally Chen and Sager (2011) note that tablet PCs mitigate the cognitive load in seeking and identifying knowledge, allowing students' to focus more on the lesson, assisting them in directing further questions, and receiving timely feedbacks thus enabling a better interactive class environment. On the other hand Yuen and Ma (2008) state that successful pedagogical use of technology is bound to the attitudes and technology acceptance of teachers. Parallel to this finding, it has been realized in other research that negative attitudes and convictions of teachers are the greatest barriers blocking students' use of technology (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012).

Lim (2011) emphasizes the effects of individual differences on the technology-adaptation process during the start-up phase of technology spread. Within this context it is feasible to refer to personal factors that have effects on behavioral intention on

the basis of technology acceptance towards tablet PCs. The effect of one of these factors, attitude variable, on behavioral intention has been analyzed in several studies (El-Gayar & Moran, 2007; El-Gayar et al., 2011; Teo, 2009). In a different study detailing tablet PC use of students, it has been mentioned that the use of these tools has positive effects in cognitive, meta-cognitive, affective and socio-cultural dimensions (Li et al., 2010).Wang and Wang (2010) report that in computers with similar features, behavioral intention is influenced by a gender variable and compared to women, men have greater self-efficacy perceptions that form greater behavioral intentions towards using such tools. Supporting this finding, in a different study it has been noted that women academicians are less inclined to adapt to tablet PCs and similar technologies (Anderson, Schwager, & Kerns, 2006).

Technical factors cover battery life, data input and communication which might be effective in the acceptance and teaching-learning processes related to tablet PCs. Technical factors can, on the whole, directly or indirectly affect perceptions on the ease of use of tablet PCs which eventually affects perception of usefulness. Teo (2009) explains that when people perceive any technology as complex, they tend to consider this technology as less useful. Becta (2005) states that safe and fast wireless networks, adequate technical assistance, and careful planning are requisites in the spread of tablet PCs. Within this framework it can be argued that along with communication skill and technical assistance, the need for extended battery life and software programs in particular can be listed as the factors that might affect acceptance and intention of use towards tablet PCs. Anderson et al. (2006) report that tablet PCs' acceptance by instructors can be facilitated by providing training on the use of these tools.

Purpose of the Study

The current study aims to demonstrate IT pre-service Teachers' acceptance of tablet PCs on personal, instructional and technical grounds within the framework of variables such as perceived usefulness and perceived ease of use.

Method

The research was patterned as a phenomenological study amidst qualitative research methods. Phenomenological study is defined as "a qualitative approach in which the researcher focuses on capturing the experience of an activity or concept from participants' perspectives" (Gay, Mills, & Airasian, 2006). Likewise, in current research, tablet PC acceptance, use, experience and perceptions of IT pre-service teachers were analyzed on the basis of the Technology Acceptance Model.

Participants

The research participants were eight IT pre-service teachers studying in Trakya University, Faculty of Education, Computer Education and Instructional Technologies Department in the 2011-2012 academic year. In the selection of these participants, one of the purposeful sampling techniques, the criterion sampling technique, was utilized. Criterion sampling is defined as analyzing certain conditions that meet pre-designated criteria. The main reason for selecting IT pre-service teachers was, by virtue of the education they receive, IT pre-service teachers, compared to candidates from other teacher training programs, possess greater knowledge and experience on the use of information and communication technologies. These pre-service teachers were senior students shortlisted for graduation. Therefore, thanks to the pre-service training they had received, they possessed adequate pedagogical knowledge necessary for the profession of teaching and they were also well aware of how to use knowledge and communication technologies for instructional purposes. Five of the participants were male and three participants were female IT pre-service teachers. None of the participants had a tablet PC and they lack previous experience on the use of tablet PC. All participants had wireless internet connections both on campus and in their place of residence.

Data Collection Tools and Data Collection

In the collection of research data, a semi-structured interview, an activity list for tablet PCs, students' reflective journals and a researcher reflective journal were used. At the onset of the research process, each participating IT pre-service teacher was provided with a tablet PC. These devices have small size (256x175x8 mm) and low weight (565g). Tablet PC's used in the research operate using the "Android Operating System" for tablet PC. These devices also have wireless connection to the internet, multimedia features, mobile office software and an e-book reader. In terms of technical and communicative software features, the tablet

PCs provided to pre-service teachers possessed an adequate configuration required to implement the processes specified under the activity list. To establish a systematic implementation process in the use of the tablet PC and to enable pre-service teachers to use tablet PCs within the context of research, the list contained a set of processes that allowed the implementation of hardware, software and communication features of tablet PCs within personal and instructional purposes. This list was not designated to limit or govern pre-service teachers' views on tablet PCs. It merely aimed to specify the technical and communicational features of tablet PCs, as well as the practices and tasks related to their instructional uses. Additionally, prior to commencing the implementation process, pre-service teachers were informed that they were not restricted to the tasks specified in the list. They were free to use tablet PCs in any way they deemed appropriate. The activity list was prepared in a draft format by the researcher to contain tasks and activities that could unveil pre-service teachers' perceived usefulness and perceived ease of use of tablet PCs within the contexts of personal, instructional and technical factors. Subsequently, the list was finalized by consulting the views of two faculty members specialized in the field of instructional technologies. Pre-service teachers were asked to use these tablet PCs during a five week period within the scope of assigned tasks and to note their experiences in their reflective journal. Reflective journals provide critical thoughts about the research process for the researcher and participants. The researcher and pre-service teachers who participated in the research implementation were allowed to ask some reflective questions such as "who," "how," "what," etc., and to evaluate the stages of research with this tool. Ortlipp (2008), emphasizes that keeping a reflective journal helps to identify the theoretical lens most appropriate for research and how to work through the implications of the chosen framework. Similarly, Farrah (2012), stated that reflective journal writing supports critical thinking and students can use it for different purposes such as establishing connections between new information and already known. During the implementation process, the challenges that pre-service teachers faced and questions on the use of tablet PC had been attempted to be solved via e-mails and face-to-face interviews.

At the end of implementation process, semi-structured interviews were conducted with pre-service teachers to determine the use of tablet PCs in general and acceptance towards tablet PCs. The interview form was prepared by the researchers after a literature review to examine research objective and scope. To achieve content validity of the interview form, the views of three faculty members specialized in instructional technologies and educational sciences were consulted. After giving its final format to interview form, semi-structured interviews were conducted with each IT prospective candidate at the end of the five-week long implementation process. The semi-structured interview form included 14 open-ended questions. Some examples of the questions used in the final semi-structured interview form are listed below:

- What can you say about ease of use of the tablet PC's based on their technical features?

- What do you think about the usefulness of the tablet PC's for individuals in daily life?

- What do you think about the tablet PC's as a learning tool in classroom settings?

- What kind of instructional contributions do tablet PC's provide for learners and teachers?

- What kind of obstacles do learners and teachers encounter while using tablet PC's in learning practice?

To record interview data, a voice-recorder was utilized. In the interview the researcher avoided manipulating the perspectives of pre-service teachers. Data triangulation was conducted that used the researcher's reflective journal and IT pre-service teachers' reflective journals in the implementation process. In the selection of participants with purposeful sampling, expert reviews on research data, findings and conformability, detailed descriptions of the research process, findings obtained in the research report, as well as similar strategies were used to ensure credibility, transferability, dependability and conformability aiming to verify the validity and reliability of research. During the implementation process and semi-structured interviews, the researcher avoided manipulating the perspective of the participants and ensured that the research process and data collection took place in an objective manner.

Data Analysis

Research data were analyzed via a content analysis technique. Content analysis is conducted in situations when the research cannot be neatly explained in a hypothetical way or when the

necessity to implement a deeper analysis emerges. Word processor, spreadsheet and qualitative data analysis software were used to analyze data. Initially, all of the research data was transferred to a computer environment. After all of the data was transferred to the computer environment, voice records of semi-structured interviews and reflective journals of pre-service teachers and the researcher were submitted to a faculty member to confirm that the data had been correctly transferred to the computer environment by the researcher. Prior to the analysis, perceived usefulness and perceived ease of use, which were widely acknowledged to be the key variables on technology acceptance, were set as main themes. Subthemes that surfaced as a result of content analysis were discussed and explained under these two main themes. Within the framework of obtained data, required codings were prepared. Thusly, subthemes formed and the views of pre-service teachers were listed below themes and subthemes. Acquired themes and subthemes were submitted to the views of a faculty member specialized in instructional technologies and qualitative research methods, and for the obtained themes inter-coder, reliability analyses were implemented. In this process, in order to demonstrate the views related to the themes, the *Reliability Coefficient Between Coders=Agreement/ (Agreement +Disagreement)* formula was used (Miles & Huberman, 1994). At the end of this process, for all the themes and subthemes, an inter-coder reliability coefficient was determined to be below the set criterion of the .70 coefficient. Hence, themes and subthemes were confirmed to be reliable.

Findings

Findings obtained from the analysis of research data have been presented in a thematic framework within the context of positive and negative views.

Findings Concerned with Positive Views for the Acceptance of Tablet PCs

In this research, the perceived usefulness and perceived ease of use acceptances of IT pre-service teachers towards tablet PCs have initially been analyzed within the framework of positive views. The themes and subthemes obtained within this framework are shown in Figure 2.

As the positive views of pre-service teachers on the perceived usefulness and ease of use variables concerning tablet PCs are examined it is determined that portability, wireless internet access and multimedia use are factors that have direct effects on both variables. It has been reported that thanks to their light-weight and small-size, tablet PCs are easy to carry and this portability allows the users to benefit from wireless internet access and multimedia features anywhere anytime. Since tablets are lighter in weight and exceptionally smaller than notebooks, they are easier to carry.

> "It is wonderful to have it when you go outside since you cannot always carry a notebook wherever you go. Notebooks are put in heavy notebook cases but you need no case for tablets." [Selda]

> "There is no problem in its portability. It is easier to carry since it is much smaller in size." [Fulya]

In addition to the portability feature of tablet PCs, pre-service teachers have reported that wireless access, which enables internet use independent of time and place, is the feature that differentiates this technology from the rest. Thanks to its wireless internet access, use of e-mail services and social networks are particularly prioritized. For people who are engaged in these services intensely, wireless internet access tablet PCs provide great comfort.

> "They are practical for accessing e-mails, spending time in social media, and reading and following the news comfortably." [Aziz]

Multimedia features of tablet PCs that pre-service teachers make the most use of are for playing games, shooting photos, listening to music and watching movies. Under this theme, multimedia features of tablet PCs are emphasized and it is reported that users can employ the features of this tool whenever they need. These views are presented alongside the portability and wireless internet access features of tablet PCs. For instance, instant share of shot photos on social media are underlined on the basis of portability advantages. Pre-service teachers have stated that via tablet PCs, music listening, movie watching and photo shooting become much easier despite some of the challenges connected to the software and hardware system. Additionally they have noted that use of the wireless internet feature is exceptionally simpler. Video chat, e-mails, and similar services are easy to perform just like desktops and notebooks.
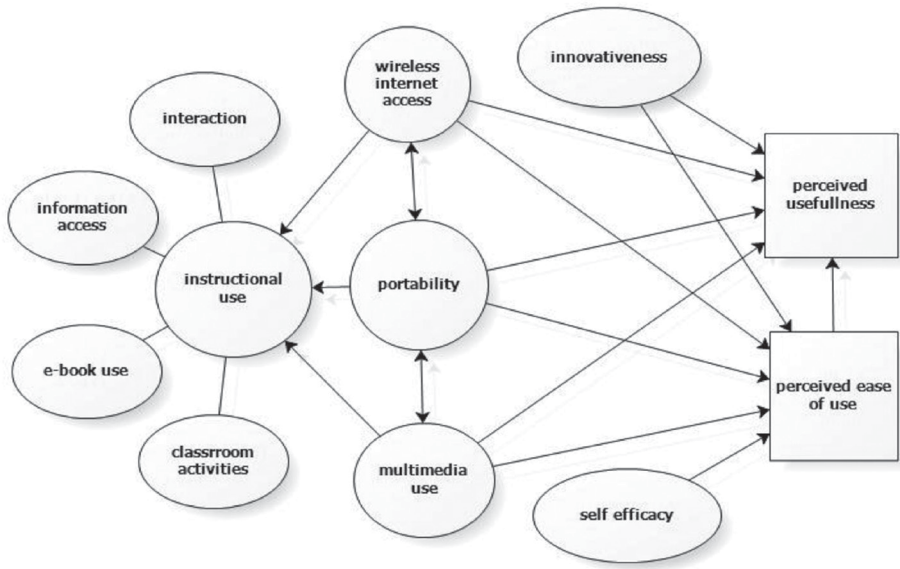
Figure 2.
Themes and Subthemes Concerned with Positive Views for the Acceptance of Tablet PCs

"When I shoot a picture, a menu is seen on the top. Then this menu is on social media. It is easy to share. Just on the top you can see Twitter, Facebook, etc. Instant use is great for anyone having internet access. It can be shared with anyone and e-mailed." [Özdemir]

"For those loving to be active in social media this is a great tool. For example, in the past we used to first shoot then share the photos but now there is instant sharing after shooting." [Osman]

Another factor that directly affects pre-service teachers' perception of usefulness attitude towards tablet PCs is related to their openness to innovation, or concept of innovativeness. Being pre-service teachers studying in a field based on information and communication technologies, interest towards new technologies is underlined and it is reported that through the application of new technologies, a usefulness based on acquiring professional experience can be obtained. It has been claimed that people open to innovations can adapt to tablet PCs and grasp the usage features of these tools much easier. Within this scope, it is reported that users eager to manipulate tablet PCs and possessing individual innovative attributes may bear higher levels of perception towards ease of use.

"I am someone eager to experience new technologies. I have never feared of breaking down any tools. I have always investigated deeper and analyzed further...Others may have

different views on this technology but naturally I was filled with joy. I rushed home, opened and used it an entire day." [Mehmet]

It has been worded that another salient factor that affects perception on ease of use of tablet PCs is self-efficacy. Accordingly pre-service teachers argued that self-efficacy perception towards the use of tablet PCs can be positively effective on their perception towards the ease of use of these tools. They have also claimed that these tools are easy to obtain and for pre-service teachers who possess certain levels of knowledge and skills on the use of technology it is much simpler to learn the use of these tools.

"I had never used it before. It might be donkey work for someone with no experience but personally I have the capacity to use its features comfortably." [Özdemir]

"I knew there would be certain challenges but it is easier to overcome these challenges through practice and new applications. The key reason I encountered challenges was because I did not have an android. By using this tool I learned to use both androids and tablets, and that has been a real experience for me." [Mehmet]

Based on instructional factors it is realized that perceived usefulness and ease of use towards tablet PCs are centered upon the sub-themes of establishing communication, access to information,

e-book reading and in-class activities. Regarding perception on instructional usefulness, pre-service teachers at first emphasize student-teacher interaction which is then followed by student-student interaction. Students have reported that via wireless internet access they can reach their teachers and other students via e-mails anywhere anytime and simultaneously they can share course notes via video chat. In a different subtheme they have explained that instead of printed materials, books in particular, use of e-books and documents on tablet PCs is more useful for instructional purposes and they have also indicated that through note taking and drawing on these electronic materials it is possible to achieve further active use. Pre-service teachers have explained that it is easier to read on tablet PCs; page turning and note-taking while reading are done much more easily.

> "For example, e-book is great. There are some creative works to be downloaded I feel there is no need for books anymore. You can download the book, turn the pages, and leave brackets and marks on the page." [Selda]

> "In student-teacher interactions, I feel if the teacher sets the environment, then s\he can establish video or audio interaction with the students on social networks or Messenger." [Özdemir]

> "Now there is no need to carry loads of books. Just store them on the tablet then read. The tool already saves them as books. It is designed perfectly, just like opening and reading an actual book." [Selda]

The access to knowledge subtheme consists of the views of pre-service teachers regarding access to course materials in or outside the class using the wireless internet feature of tablet PCs. Pre-service teachers have also reported that via tablet PCs, electronic course materials can be carried anywhere, which allows them to access knowledge anywhere, anytime.

> "I would like to say that they are useful in searching and learning unknown words etc. in any lesson." [Ramazan]

Multimedia use has also been evaluated on the basis of using tablet PCs throughout the teaching-learning process. Pre-service teachers have suggested that in technology-assisted learning environments where tablet PCs are used through the employment of multimedia applications such as audio, animation and video, it is possible to conduct further effective courses for students with dissimilar

perceptive choices which would then allow active and willful involvement of students in the lesson. Although pre-service teachers have reported that they faced challenges in processes needing design-based and lengthy data entries, in their views related to technical factors on the ease of use, they have acknowledged that in terms of graphical interface creation and basic user processes, data input is easier. They have particularly underscored that the screen keyboard and screen control via touch are eases of use.

> "I believe video watching is one of the learning assets for me which can be possible via multimedia. Audio/video animations are great advantages for applications. Instead of using books as in the traditional class environment, it is possible to conduct teaching according to a variety of new styles which is exhilarating." [Aziz]

> "At first I had doubts if I could do all the things without a mouse. For instance, right button pop up menu is one of my addictions. I was really in-between, but then I discovered that this tool is even more flexible." [Osman]

Findings Concerned with Negative Views for the Acceptance of Tablet PCs

In this research on the basis of perceived usefulness and perceived ease of use, tablet PC acceptances of IT pre-service teachers have been analyzed within the framework of negative views. Themes and subthemes obtained within this framework are provided in Figure 3.

As pre-service teachers' negative views related to perceived usefulness and perceived ease of use variables pertaining to tablet PCs are examined, it surfaces that software, hardware, and communication challenges are factors directly affecting both variables. These three factors are particularly interconnected in hardware and software dimensions, and the challenges experienced in these dimensions are directly and negatively influential on perceived usefulness and perceived ease of use. On the other hand it is reported that a lack of experience on tablet PC use affects all these factors in a negative direction. For those people with inadequate knowledge and experience on the use of information and communication technologies, there are certain challenges faced in the use of these mobile tools. Pre-service teachers have noted that effective use of tablet PCs by teachers in learning environments is affected negatively by lack of adequate knowledge
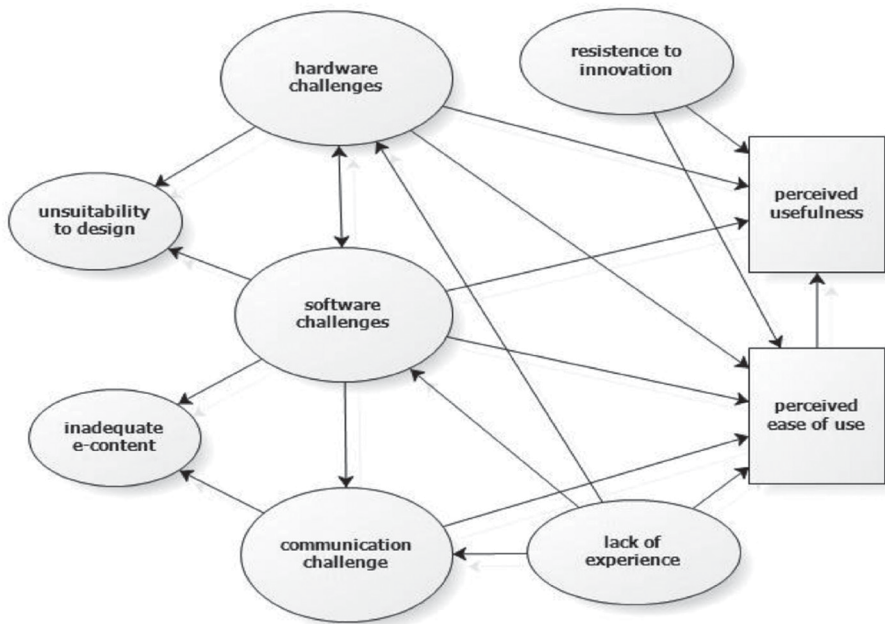
Figure3.
Themes and Subthemes Concerned with Negative Views for the Acceptance of Tablet PCs

and experience, and not knowing the way to use these tools in course activities. In return this might have negative effects on the perceptions toward the ease of use. They have also indicated that aside from lack of knowledge and experience, teachers who use traditional methods in learning environments and people who show resistance to new technologies like tablet PCs may be less inclined towards using tablet PCs. In relation to this dimension there are some negative views arguing that tablet PCs can alienate people which in turn might trigger a variety of social and psychological problems.

"Not only the advantages of technology but the values that technology steals away from humanity should be accentuated, although tablet makes one feel like reading it is actually not reading. It seems like a way of socialization which is in fact quite the opposite." [Aziz]

"Some teachers may even be resistant to learning this technology…we attempt to achieve some things in a short time but then we fail…for instance an instructor of age 40 cannot use the tablet easily, s/he would not want to learn either. If you force that would not be effective." [Mehmet]

"I experienced difficulty in using because I am not used to touch screens. Since it had no manual I went through a lot of hardships to explore every item in detail." [Fulya]

As regards hardware challenges, the foremost obstacles are inadequate memory and processor speed, unfavorable keyboard and data input means, necessity to use supplementary hardware in projector connection and inadequacy of internal storage capacity. The primary hardware challenges are keyboard challenges originating from data input. Due to an non-ergonomic screen keyboard and impractical use of Turkish characters, pre-service teachers claim that data input is filled with challenges. Additionally, due to inadequate memory and processor speed, they argue that its use becomes harder, which in turn negatively affects perception on the ease of use.

"Screen keyboard is extremely sensitive to instant touches and gives direct response whenever we touch but when we enter Turkish characters, the transmission period in between slows down our data input speed." [Osman]

The views on software challenges have been listed as failure to identify different file formats, particularly for multimedia environment components, and inadequate software assistance. Another software challenge is the failure of tablet PCs to perform more than one process simultaneously (failure to perform multiple processes). Pre-service teachers have claimed that they fail to use the software enabling their easy use of familiar processes, that

they need supplementary software or plug-ins in order to use multimedia environments files and that they encounter challenges concerning the use of a web browser interface.

"Since the programs cannot be adapted into android we cannot use [many programs] but for the users of Word, Excel like office secretaries or companies operating with an internet browser, this tool is quite practical." [Osman]

"I encountered challenges in back and forward keys, opening a new tab, and closing pop-ups. I could not open a Facebook video. While traveling, I was going to watch a video on the NTV sport channel. It demanded an updated version of the flashplayer, but I could not download the requested version." [Aziz]

Negative views pre-service teachers submitted on communicational technical factors are listed under the communication challenges subtheme. Accordingly, problems encountered in audio and video synchronization during video communication, in particular the lack of uninterrupted internet service, are some of the failures impeding the effective use of the communication features of the tablet. Besides, the impracticality of the web browser and failure to identify the file format of multimedia components accessed on the internet are the kinds of communication challenges concerning the use of software.

"I tried to talk with my cousin by using my own program. We started the video program while talking but it just disappeared. We tried again and this time the voice was lost. So we could not start audio and video simultaneously." [Fulya]

The views concerning instructional factors negatively affecting perceptions of usefulness and ease of use of tablet PCs are listed under subthemes such as: unsuitability to design and inadequate e-content. Particularly voice recognition, since data input means are limited compared to the keyboard use that pre-service teachers are familiar with. Instead of instructional tasks that require intense data input and design-facilitating tools, tablets are more appropriate to reading and communication-based applications. Besides under the inadequate e-content subtheme, another major disadvantage reported is that the instructional programs used in tablet PCs are not in the Turkish language. It has also been noted that inadequate e-content, unsuitable for students' needs, can also affect student-content interaction negatively.

"Tablets are more practical than computers in PDF reading but in Word or Power Point programs, it is far behind computers." [Fulya]

"If prepared contents are not suitable to a tablet PC, I think student-content interaction will also be poor." [Osman]

Discussion and Conclusion

In the current research it has been demonstrated that personal, instructional and technical factors have certain effects on IT pre-service teachers' technology acceptance towards tablet PCs. Obtained findings illustrate that perceived usefulness towards tablet PCs is evidently identified with wireless internet connection and portability. This finding is directly or indirectly worded by all research participants. Echoing the findings of present research, Becta (2005) draws attention to the effect of safe and fast wireless networks on the spread of tablet PCs. Wang and Wang (2010) argue that the performance expectation for mobile internet has a strong correlation with behavioral intention to use.

In this research it has been observed that regarding the use of tablet PCs, multimedia tools and e-book reading are factors that have positive effects on perception of usefulness. It has also been verified that in meeting daily-life personal requirements of pre-service teachers, as well as executing works and tasks in the learning environment, there is a clear perception of usefulness towards tablet PCs, and this perception has positive effects on active usage and acceptance of tablet PCs. Parallel to the findings of the current research, in a set of researches in relevant literature, perception of usefulness towards tablet PCs in personal, instructional and technical dimensions have been presented (Chen & Sager, 2011; El-Gayar & Moran, 2007; El-Gayar et al., 2011; Li et al., 2010).

Other findings of present research show there exists a widespread perception and conviction that tablet PCs, by virtue of their ability to address students with dissimilar learning styles as well as having a structure that facilitates access to knowledge, can affect academic success in a positive way. Findings such as different learning styles, access to knowledge anytime and anywhere, and creating further effective learning environments through manipulating multimedia features, indicate that on the basis of instructional factors there is an evident perception of usefulness on tablet PCs. To exemplify, Li et al. (2010) report that tablet

PCs affect students positively in cognitive, meta-cognitive, affective and socio-cultural dimensions. Chen and Sager (2011), while defining interactive class environments set via using tablet PCs, point out real time interaction established on wireless networks. As regards tablet PCs, it has been manifested in this research that there is an obvious perception of usefulness on interacting with others through social networks in a virtual environment. Echoing this finding, El-Gayar et al. (2011) assert that this social effect has a positive impact on the acceptance of tablet PCs. In their studies, Wang, Wu, and Wang (2009) and Habboush, Nassuora, and Hussein (2011) report that this social effect is one of the predictors of acceptance.

On the other hand, within the scope of this research, negative factors consisting of technical challenges related to software and hardware problems in particular have also been linked to the perception of usefulness towards tablet PCs. Aside from that, technical factors have an apparent negative effect on personal and instructional factors. Obtained findings manifest that regardless of all these negative factors, difficulties in data input and unsuitability of tablet software design have negative effects on the perceived usefulness. As demonstrated similarly by Garfield (2005), in this research, it too has been detected that one of the greatest challenges of tablet PCs are related to the difficulties in data input. This challenge has made electronic material generation, and use in homework and course activities more complicated and difficult.

It has been detected in the current study that one of the factors affecting perceived usefulness negatively is that it is necessary to use supplementary hardware to use tablet PCs integrated with in-class instructional technologies such as projectors. The same finding is underlined in several researches in literature. For instance while Hetebry and Caporn (2007) underscore the positive effects of tablet PCs on teaching-learning processes, they explain that a wireless network, projector and a suitable e-learning environment are necessary substructures. The need for supplementary hardware to effectively use tablet PCs in class environments complicates the use of these tools and makes the use of the tablet PC even harder for teachers. In line with this perspective, Teo (2009) agrees that people tend to use a technology less frequently if they perceive it as complex.

It has been illustrated in this research that in the integration of tablet PCs with classroom activities, providing an uninterrupted high-speed wireless network connection, supporting learning processes

via software that facilitates electronic material design, and the use of teachers and students, all of these shall positively affect acceptance towards tablet PCs. It has also been found out that provided that tablet PCs are equipped with software items facilitating data input and integration with other in-class technologies, it shall positively affect acceptance towards tablet PCs and perceived usefulness as regards the contribution of these tools towards teaching-learning processes. In line with this perspective, towards the aim of elevating pre-service teachers' perceived usefulness towards tablet PCs, it is required that the learning environments have wireless internet access, classroom activities be planned to around tablet PCs, and processes that call for design and long data-entry should be avoided. To support perception of usefulness, in addition to the suitability of communication and software substructure for e-learning activities that shall be conducted via tablet PCs, the improvement and use of software programs that can assist in-class teaching program and in-class cooperation and interaction are also useful approaches.

It has been identified in this research that pre-service teachers' perceptions on the ease of use of tablet PCs are, on the basis of negative and positive views, mostly shaped under technical factors. On the other hand, on the basis of ease of use of technical factors, a specific cause and effect relationship has been provided with personal and instructional factors. In addition to the portability feature of tablet PCs, with the use of multimedia tools and wireless internet access, perception on the ease of communication has been featured. Nonetheless, the impracticality of data input methods, the challenges concerning communication-based Web browsers, and video chat software are listed as negative conditions related to technical factors. El-Gayar et al. (2011) have noted that ease of use perception towards tablet PC has a positive effect on perceived usefulness. Likewise, Teo (2009) claims that perceived ease of use, technological complexity, and facilitating conditions all have an indirect effect on behavioral intention to use. It has been concluded that the fact that pre-service teachers' perceptions on the ease of use of tablet PCs are mostly centered upon technical problems has negatively affected perceived usefulness towards these technologies and general acceptance towards information and communication technologies.

Nonetheless it has been detected that innovativeness and self-efficacy variables render positive effects on the perception of ease of use towards tablet

PCs while lack of knowledge and experience and resistance towards innovations have negatively affected perceptions of ease of use. Within this framework it is determined that in relevant literary studies similar findings have been presented. To illustrate, Teo (2009) points out that computer self-efficacy has a direct effect on perceived usefulness and perceived ease of use. Chen and Sager (2011) likewise underline that self-efficacy contributes positively to behavioral intention. Anderson et al. (2006) have reported that support and training needed to enhance the acceptance of tablet PCs by faculty are relatively easy to implement. Within this framework a variety of suggestions can be proposed to assist pre-service teachers in cultivating a positive perspective towards the ease of use of tablet PCs and also to assist them in using these technologies more comfortably and effectively in both personal and instructional applications. Trainings can be provided to teachers and pre-service teachers who shall use tablet PCs for instructional purposes in the fields of rendering continuous technical assistance and improving their knowledge and skills concerning the use of tablet PCs. Additionally, during the pre-service training period, pre-service teachers should be trained by making use of an innovative perspective emphasizing the necessity of implementing information and communication technologies for instructional purposes. Besides, teacher trainers can act as role models for pre-service teachers in the use of tablet PCs and similar information and communication technologies for instructional purposes and the implementation of these technologies in a variety of classroom activities may enhance pre-service teachers' perception of self-efficacy. The planning of classroom activities parallel to the technical capacity of tablet PCs, wireless internet access availability of a school, and restricted software assistance may also prevent the emergence of potential challenges.

To sum up, in this research analyzing technology acceptance towards tablet PCs on the basis of perceived usefulness and perceived ease of use in terms of personal, instructional and technical factors it has been determined that IT pre-service teachers entertain a certain level of perception of usefulness and ease of use towards tablet PCs which in turn directs in a positive way their attitude and behavioral intention to use. Nonetheless it has also been detected that various challenges concerning the hardware, software and communication and emerging on the basis of perceived usefulness and perceived ease of use variables may have negative effects on attitude and behavioral intention to use. It can thus be argued that pre-service teachers have a certain level of technological acceptance towards tablet PCs. However, in order to raise this level to higher stages, technical challenges need to minimized, uninterrupted wireless internet access needs to be established, and more functional software assistance for personal and instructional purposes must be provided. However this research has certain limitations. The research patterned in a qualitative perspective and technology acceptance model has included a limited number of IT pre-service teachers. Hence, obtained findings are limited with the views and perceptions of participants within the framework of the technology acceptance model and tablet PC devices' operating system features, hardware and software specifications. In order to generalize obtained findings, similar researches covering acceptance towards tablet PCs and its instructional use should include larger samplings. It is suggested that findings uncovered in this research may prove to be particularly useful in the design of teacher education process and m-learning settings that are conducted via technology integration with instructional and mobile technologies.

References

Alvarez, C., Brown, C., & Nussbaum, M. (2011). Comparative study of netbooks and tablet PCs for fostering face-to-face collaborative learning. *Computers in Human Behaviour*, *27*(2), 834-844.

Amelink, C. T., Scales, G., & Tront, J. G. (2012). Student use of the tablet PC: Impact on student learning behaviors. *Advances in Engineering Education*, *3*(1), 1-17.

Anderson, J. E., Schwager, P. H., & Kerns, R. L. (2006). The drivers for acceptance of tablet PCs by faculty in a college of business. *Journal of Information Systems Education*, *17*(4), 429-440.

Becta. (2005). *Tablet PCs in schools: A review of literature and selected projects*. Retrieved from http://dera.ioe.ac.uk/1461/

Bozdoğan, A. E., & Uzoğlu, M. (2012). The development of a scale of attitudes toward tablet PC. *Mevlana International Journal of Education (MIJE)*, *2*(2), 85-95.

Chen, F., & Sager, J. (2011). Effects of tablet PC use in the classroom on teaching and learning process. *Journal of Learning in Higher Education*, *7*(2), 55-67.

Çiftçi, S., Taşkaya, S. M., & Alemdar, M. (2013). The opinions of classroom teachers about FATIH project. *Elementary Education Online*, *12*(1), 227-240.

Davis, F. D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* (Doctoral dissertation, MIT Sloan School of Management, Cambridge, MA). Retrieved from http://hdl.handle.net/1721.1/15192.

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

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982-1003.

Dickerson, J., Williams, S., & Browning, J. B. (2009). Scaffolding equals success in teaching tablet PCs. *The Technology Teachers*. Retrieved from http://www.highbeam.com/doc/1G1-193298064.html

El-Gayar, O., & Moran, M. (2007). Examining students' acceptance of tablet PC using TAM. *Issues in Information Systems*, *8*(1), 167-172.

El-Gayar, O., Moran, M., & Hawkes, M. (2011). Students' acceptance of tablet PCs and Implications for educational institutions. *Educational Technology & Society*, *14*(2), 58-70.

Enriquez, A. G. (2010). Enhancing student performance using tablet computers. *College Teaching*, *58*, 77-84.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, *59*, 423-435.

Farrah, M. (2012). Reflective journal writing as an effective technique in the writing process. *An-Najah University Journal for Research-Humanities*, *26*(4), 997-1025.

Garfield, M. J. (2005). Acceptance of ubiquitous computing. *Information Systems Management, 22*(4), 24-31.

Gay, L. R., Mills, G. E., & Airasian, P. (2006). *Educational research competencies for analysis and application* (8th ed.). New Jersey: Pearson Merrill Prentice Hall.

Gill, T. G. (2007). Using the tablet PC for instruction. *Decision Sciences Journal of Innovative Education*, *5*(1), 183-190.

Güven, İ. (2012). The 4+4+4 school reform bill and the FATIH Project: Is it a reform? *Elementary Education Online*, *11*(3), 556-577.

Habboush, A., Nassuora, A., & Hussein, A. (2011). Acceptance of mobile learning by university students. *American Journal of Scientific Research*, *22*, 119-122.

Hetebry, J., & Caporn, N. (2007). Tablet PC's a tool for teaching-learning Penrhos College. In M. B. Nunes & M. McPherson (EdS.), *IADIS International Conference e-Learning* (pp. 218-221). Lisbon, Portugal.

Kukulska-Hulme, A., & Shield, L. (2008). An overview of mobile assisted language learning: From content delivery to supported collaboration and interaction. *ReCALL*, *20*(3), 271-289.

Kyu, Y. L. (2011). What does the tablet PC mean to you? A phenomenological research. *Innovations in Education and Teaching International*, *48*(3), 323-333.

Li, S. C., Pow, J. W. C., Wong, E. M. L., & Fung, A. C. W. (2010). Empowering student learning through tablet PCs: A case study. *EducInfTechnol*, *15*, 171-180.

Liaw, S., Hatala, M., & Huang, H. (2010). Investigating acceptance toward mobile learning to assist individual knowledge management: Based on activity theory approach. *Computers & Education*, *54*, 446-454.

Lim, K. Y. (2011). What does the Tablet PC mean to you? A phenomenological research. *Innovations in Education and Teaching International*, *48*(3), 323-333.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2th ed.). California: Sage.

Ortlipp, M. (2008). Keeping and using reflective journals in the qualitative research process. *The Qualitative Report*, *13*(4), 695-705.

Steinweg, S. B., Williams, S. C., & Stapleton, J. N. (2010). Faculty use of tablet PCs in teacher education and K-12 settings. *TechTrends*, *54*(3), 54-60.

Teo, T. (2009). Modelling technology acceptance in education: A study of pre-service teachers. *Computers & Education*, *52*, 302-312.

Wang, H., & Wang, S. (2010). User acceptance of mobile internet based on the unified theory of acceptance and use of technology: Investigating the determinants and gender differences. *Social Behavior and Personality*, *38*(3), 415-426.

Wang, Y., Wu, M., & Wang, H. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, *40*(1), 92-118.

Yuen, A. H. K., & Ma, W. W. K. (2008). Exploring teacher acceptance of e-learning technology. *Asia-Pacific Journal of Teacher Education*, *36*(3), 229-243.