Petar Vrgović
Ivana Jošanov - Vrgović
Borislav Jošanov

SMS Information Service: Innovative Thinking for the Successful Solution

Article Info:

Management Information Systems,
Vol. 6 (2011), No. 3,
pp. 022-028

Received 18 November 2010
Accepted 21 April 2011

UDC 004.7:621.39 ;
005.591.6:37.01(497.113)

Summary

Traditional usage of mobile phones for SMS messages, boom-calls and conversation is still dominant in all European regions, but the usage of other different services is on very low level. In order to analyze that, we focused on student information system in Novi Sad Higher School of Professional Business Studies, organized on multi-channel infrastructure, with the important role of the service based on mobile infrastructure and SMS. The problems of adoption of this information channel and parallel analysis with the Web-based information channel and an analysis of the structure of those communications with the innovative solution as the result are the main topics of this paper.

Key words

innovation, mobile, SMS, adoption

1. Facts About Mobile Communication Growth

The world is increasingly connected place today. Enormous potential could be found in less than 2 billions of Internet users and more than 5 billions of mobile phone users in the world, registered in 2010. It is an evolving, dynamic, unique and rapidly changing communication channel with its own characteristics and concept (Lindsay, 2000).

Wireless communication technologies are diffusing around the world faster than any other technology to date. The explosive growth of penetration and usage of mobile devices is dramatically changing our communication attitudes. Mobile communication brought new paradigm to the global environment: it allows multimodal communication from anywhere to anywhere at any time, reinforcing the platform of network society by the fact that individual becomes always available node in the worldwide mobile network. In this way society finds new social structure and social practices organized around networks of communication and information.

Starting with voice and short messaging service (SMS), it grew to sending pictures and short audio/video clips (MMS) while mobile networks from 3G and beyond became capable for video streaming service of adequate quality. Traditional usage of mobile phones for SMS messages, boom-calls and conversation is still dominant in all European regions. We could say that SMS is the most important mobile service in the world today.

Mobile technologies which enable collection, delivery and exchange of timely information have the potential to revolutionize new services, leading to more efficient information systems. However, effective management of the systems development and integration with regard to end user acceptance is vital for the benefits offered by such technologies (Burgess, Cooper, & Sargent, 2008).

The high acceptance rate of mobile technologies has triggered the development of different services. Despite the potential and expectations, the uptake of mobile services so far has been disappointing. The adoption of mobile services is hampered by an apparent lack of added value, a mismatch between launched applications and the everyday needs of target users, and ineffective business models (Vos, Haaker, & Teerling, 2008). Consumer attitudes could provide crucial information on interest of mobile phone users, which will help in future design of these services. In this paper we focus on the adoption of the similar information services, the first one created as a Web site, and the second implemented through with the SMS as the information infrastructure and analyze the reason for the significantly different levels of adoption.

2. Related Works

We face in these days the lack of theoretical and empirical foundations for analyzing the implementation and success of these new services (Carroll, 2006). When we think about services with strong network effects, the importance of

expectations should not be underestimated. Adoption research typically studies users' decision to adopt a particular technology or service or their individual choice of media and pattern of media use at the individual level of analysis (Pedersen & Ling, 2003).

Most of the authors who wrote about the adoption of mobile services, advocate that the most useful in explaining mobile services acceptance of an early adopter are 3 well known accesses: technology acceptance model (TAM) (Davis, 1989), (Davis, Bagozzi, & Warshaw, 1989), modified theory of planned behavior (TPB) (Ajzen, 1985) and innovation diffusion theory (IDT) (Rogers, 2003). Venkatesh and Davis (2000) extended the original TAM model to TAM2, explaining perceived usefulness and usage intentions in terms of social influence and cognitive instrumental processes. An attempt to integrate the main competing user acceptance models is described by (Venkatesh, Morris, Davis, & Davis ,2003) and it is formulated the unified theory of acceptance and use of technology. This model was found to outperform each of the individual models, holding the four key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions.

TAM is the model that can analyze acceptance of mobile telephony, with ease of use and usefulness as the central factors, but also with the addition of enjoyment and new possibilities recognized in the functionality of mobile devices (Carlsson, Hyvonen, Repo, & Walden, 2005). TPB studies the adoption intention of people on innovation, predicting the behavior of an end-user to accept a system according to the knowledge of what attributes or beliefs lie behind a person to construct or formulate the intention. Individual behavior intention, according to TPB, is jointly influenced by attitude, subjective norms, and perceived behavioral control (Venkatesh & Bala, 2008). According to Rogers (2003), diffusion research centers on the conditions which increase or decrease the likelihood that a new idea, product, or practice will be adopted by members of a given culture. IDT posits a set of innovation attitudes like relative advantage, complexity and compatibility.

Research model of Wang and Liao (2008) is based on all main constructs of TAM, TPB and IDT, but changing TBP's constructs subjective norms with social influence and perceived behavioral control with perceived financial resources. Jansen and Zeef (2006) suggest that more complicated model is needed to explain acceptance, with characteristics such as elements of trust and bundles of presented services. An important stimulus for an individual decision to adopt some new infrastructure, according to the same authors, is massive adoption, which can be well observed in adoption of electronic card payment systems. Some authors advocate that price in service is the most important of potential adoption factors (Khalifa & Shen, 2006), while the study by (Shin & Kim, 2008) explores attitudinal and behavioral patterns of expanded TAM in the adoption in cyber world. An examination mainly from application and research methodology perspectives presents major types of current context-aware mobile applications (Zhang, Adipat, & Mowafi, 2009). (Mallat, Rossi, & Tuunainen, 2008) analyze the theoretical background of technology adoption and trust theories, which are augmented with concepts of mobile use context and mobility, while Xu and Yuan (2009) propose a user adoption model of mobile commerce with a consideration of context and incentives. Forecasts about the future of wireless technologies are presented by Nickerson (2008), while deeper analysis of current mobile wireless issues and technologies is given in (Shim, Varshney, Dekleva, & Nickerson, 2007). An interesting research explores the process of mobile service adoption and targets identifying the preferred features of mobile services (Kargin, Basoglu, & Daim, 2009). The study of (Pedersen, Nysveen, & Thorbjørnsen, 2007) defines adoption model underlying the analysis of the motivational, attitudinal, social and resource-related influences on adopters' intention to use mobile services. Another research evaluates the applicability of innovation attributes constructs in analyzing the adoption of mobile banking (Hundal & Jain, 2006), while the study by (Lu, Deng, & Wang, 2007) examines enterprises' adoption of SMS based on the innovation diffusion theory and the task-technology fit model. Lazy user model of solution selection, created by (Collan & Tetard, 2007), starts from the observation that there are clearly definable user needs that he wants to satisfy, where they define the set of possible solutions and select one with the lowest combination of costs, time and efforts.

3. Research Framework

More than 86% of the Novi Sad Higher School of Professional Business Studies (NSHS) students are not residents in Novi Sad, about 16% of them are citizens of the neighboring countries where Serbian

language is well understood: most of them are from Bosnia & Herzegovina, significant number of them is from Montenegro and the smallest number is from Croatia. That is why students prefer to use information services from their home, instead of going to school for that reason. The information system, created to inform students about their main interests, is designed on the principle called "convergence of all platforms", with online transactions, intranet and data base as the main carriers of information flow and acquisition. Multiple channels for services could be available for student use: face-to-face, information board, fixed phone, information kiosks, Web site and SMS gateway. Common functionality of this students' information system contains schedules for teaching, examinations and consultations, examinations results or their parts, and other unstructured information (Jošanov, Marošan, Jošanov, & Tomić, 2007). Multi-channel organization of information infrastructure gives good opportunity to the students to choose how they will get their information.

The main idea for this research is based on the fact that mobile service created for students' information in NSHS through the SMS Gateway has very low rate of usage. Before NSHS started this service in 2006, 93% of their students told that they would like to use SMS information, but after more than 4 years of usage there are less than 6,000 received requirements for information. On the other hand, there are more than 2,000,000 registered visits in 8 years of NSHS Web site existence. We wanted to find out why students prefer to find information on school's Web site, instead of using SMS for the same purpose. As we could not find suitable model for this evaluation, we decided to create our own model and make this investigation among NSHS students, using all accessible information and statistics which we found in NSHS. Our main motivation was to raise the usage of SMS service. Our research question is: why students significantly prefer NSHS Web site to the similar SMS service in the same institution?

This case-study approach limits the results of this research on these special information services, but the results of the research are also used for generalization and proposition of new approach to the usage of mobile services.

Information for this research was also taken from statistics about automatically generated SMS messages and Web site statistics, from a survey conduced among 90 third year students from NSHS, research among the students done on the NSHS Web site, and from the dialogues with students during the lectures of introduction to e-business.

For the survey among the students we created a questionnaire with 6 questions about the students' accessibility to the Internet and mobile phones, usage and reasons for that of the NSHS Web site and SMS gateway system, and to what extant they are satisfied with these services. They gave their anonymous answers to that questionnaire. The focus of this research will be restricted to adoption of usage SMS messages for student's information, while the usage of Web site will be taken for parallel analysis.

The results of the research are analyzed from the perspective of basic constructs in TAM: perceived usefulness and perception of use. Specifically for mobile services, enjoyment, new possibilities of services, price and massive adoption are also taken as important constructs for this research.

Those results of the NSHS SMS service research are used for the generalization, which lead to the transaction scenario with postponed answers, as new, more successful information model of NSHS SMS information system.

4. NSHS Web and SMS Services: Survey Results

When we look at the results of our survey we can find that all the students from our sample are using NSHS Web site (only 50.53% of them did it in 2004), where 57.78% of them use the Internet every day, 33.33% almost every day, and 8.89% of them are rarely using the Internet. The opinions about NSHS Web site are similar: 94.44% of them think that the site is updated on time – 71.11% of whom think that it is easy to use, while 23.33% disagree. Only 5.56% of students think that the Web site doesn't have enough information. When 563 students estimated NSHS Web site in anonymous poll with the degrees from 1 to 5, average degree was 4.13. We can conclude that NSHS Web site found very good place in students' information system.

The data taken in the survey about the usage of mobile phones gives very similar picture: 68.89% of NSHS students are using the mobile phone all the time, 27.78% almost every day, 1.11% of them are rarely using mobile phones, while 2.22% are not using mobile phones at all. Between those 2 groups of the Internet and mobile phone users we calculated strong correlation: ϱ=0.976. This shows that penetrations of the Internet and mobile

technologies among NSHS students are nearly the same.

NSHS SMS service is the result of the cooperation with the Italian software and service integrator, which began with work in HSHS in May 2006. This tool requires use of common words (triggers) to elicit information on demand. In this manner individual words took on modified meanings associated with technology use. When the students registered to use the SMS application the system responded to them with a precisely personalized message, as it is described by Georgiadis and Manitsaris (2005). The number of student index is the identification and the key for the query. Thus, the students can send SMS message and get, as a result, information about schedules for their examinations, information if they are on examination lists and the result of their examination. These are 3 of the top 4 reasons for visiting (only unstructured information couldn't be processed through SMS messages). The statistics found in the application system shows that 17.99% of those messages have incorrect structure of data and the answer can't be structured properly, and that 1.20% of the messages couldn't get the answer because the query came during the uploading of data base to the SMS server. Most of these messages are queries about the examinations results. A disappointing fact in usage of NSHS SMS service is that even 73.33% of students are not using that service at all.

The presented data show us a wider picture, where we found the following facts important for the adoption of this SMS service. If we look at the two TAM basic constructs we can find the reasons why NSHS Web site is so far more popular than NSHS SMS service:

- perceived usefulness of SMS service is behind the Web, whose functionality is larger and more interesting,
- perception of use also shows a bad situation because this service is not easy to use, with a slow procedure of data entry, too many mistakes in that process and with the possibility that you do not get the answer because of technical reasons.

There are also the other reasons for such bad results for SMS service:

- because of fully personalized communication, SMS service gives the exact information which was asked and there is no fun like surfing the Web,
- as it is designed like a business service from the third party, there are no innovations and new possibilities,
- one of the main reasons to use SMS service instead of WAP was the price, because SMS service and usage of the Web are almost on the same level, but there is just one more problem: students have restricted funds for mobile phones, but they use the Internet from their homes and their parents are paying bills every month,
- finally we can find massive adoption of mobile phones, but they are traditionally used for inter-person communication, while the usage of Web for searching the Internet in order to find new information is a standard procedure today.

Students are using less HSMS SMS service from HSMS Web site although their possibility to use the Internet is smaller than their usage of mobile phones today. What can we say about the future of this message service?

5. New Values of Mobile Services

In NSHS information system mobile telephony has an inferior level in accessibility to the information than their Web site, with minor multimedia facilities, inconvenient input and output components with smaller screens and keyboards, and less network connection speeds than desktop computers. Those devices are very difficult to use in specific formats with not so convenient keyboards. Complexity of devices and the feeling that it is possible to spend a lot of time browsing and reading broadcast messages which can transform into errors, wasted time and user disappointment is putting off potential users. Most people are too impatient these days and they want the one-click instant gratification. Those are important reasons for the fact that SMS services must have strong new value which will help in finding their consumers. For instance, mobile application can support or even replace paperwork on processes that are not part of the core business and it is also possible to use mobile application in monitoring (Leskinen, 2008).

The most important implemented SMS services include sending textual information, like football scores, weather reports, emergency news, etc. The other significant services are information-on-demand systems, like news services, stock tickers, banking and stock brokerage applications. They are using SMS messages, but also and mobile Internet access services. A core value element in mobile services is that they can be used anytime and anywhere, which enables people to communicate or to access information at any location, any time and in any situation. According to Keen &

Mackintosh (2001), the fact that people love both their mobile phones and the Web browsing doesn't mean that putting the two together in itself adds value to either of them. It is important to find the solution which will come from the nature of the mobile communication infrastructure. The **s**tarting point could be found in something that is called Braudel Rule (Keen & Mackintosh, 2001): "Freedom becomes value when it changes the limits of the possible in the structures of everyday life".

Let us just take a look at the transaction scenario implemented in NSHS Web site. We can see that there are two connections to the NSHS network service, one is with the user/consumer of the service, and the other is through the application layer with the database in the background of the site. Both of them are with the on line exchange of transactions. That means that consumer can get the representation of the information at the moment when transactions are taking place.

On the other hand, we have NSHS SMS transaction model with exactly the same scenario, which is designed as a replica of the Web scenario. The expectations were that students will use it because they are familiar with mobile phones and they are using it all the time. But there is not any new value added to the Web transactions. We didn't think about Braudel rule and the number of the service usage became insignificant. That is why we have to find it among the advantages of mobile communication technology.

The term "instant connectivity" describes the fact that it is possible to use a mobile phone with anyone at anytime at the moment of need for information. Wireless devices have the benefit to offer the opportunity of overcoming physical and time limitations. That fact is probably the most obvious advantage of the wireless services. The miniature size of mobile phones makes them an ideal channel for offering services continuously.

The fastest development and increased sophistication of mobile communication technology makes an ideal channel for personalized and context-specific services. By the term personalization we mean the provision of individual-tailored services. The level of detail, accuracy and currency opens up a broad scope of potential applications, which will meet interests and expectations of the consumers.

Among the new values characteristic for new mobile services, we emphasize the transaction scenario with postponed answers. Implementation of that mobile application scenario demonstrates some of the major design concerns that must be taken into consideration to offer such new services to the end-users. In that scenario, user activates transaction to the network service, which registers the need for a personalized answer. The answer with requested content will occur when the necessary data is present in the database. After that, answers with that content will be automatically distributed to the user's mobile device without requiring their intervention.

The key role in this scenario is in the application layer, where we have new types of transactions, main of them are triggered by the expected data in the database.

This scenario, typical for the warning messages, could be implemented also in the Web services, but the facts that mobile devices are active most of the time and the users are aware of the fact that a message arrived brings new value to the surface. This scenario unites almost all important advantages of mobile services: there is a new value in the totally personalized service, implemented through the instant connectivity, which makes new limits of freedom in structure of everyday usage of service, as it is appointed in the Braudel rule.

6. Conclusions and Future Work

We can say that we have learned a lot about the problems with the NSHS SMS information system: it is expensive, complicated to use, with a small amount of functions and information and students are abandoning it. But the most important lesson learned from this research, which comprises all previously mentioned, is that this service is not good enough. The main reason for that lies in the fact that its functionality is a copy of the similar Web service, where all of the disadvantages of an SMS service are present. Simple transition of Web functionality to the SMS is not **a** good idea. As the Braudel Rule says, we have to change the limits of the possible in the structures of everyday life. It is necessary to find new value which will attract potential consumers of the service.

Our main idea how to overcome those problems is presented in chapter 5 of this paper. Mobile service must start from the new value which is coming from the advantages of the infrastructure. The solution can be new SMS service or the solution built in the Internet infrastructure with the WAP protocol in the back. The functionality of this solution will include one important new function: it will be possible for students to make a query when they want to get the results of an examination at the moment when new

data is integrated in the database of the information system.

When we asked students about their opinion of this new service, 100% of them stated that they would like to use it. We strongly believe that such a solution will have **a** good future and the results of that solution will be presented in some future papers.

Our main conclusion is that we must think seriously about the advantages of the infrastructure when we are going to create new service. These advantages should be the origin for new value which will be clearly recognized by the consumers. They will not change the service just because they can use new one, there must be a well recognized new value for that decision. When we think about the use of mobile communication, new values have to be found in the core of its paradigm: multimodal communication from anywhere to anywhere at any time. Integration of mobile communications with the information system can create this new value, described as transaction scenario with postponed answers in this paper.

References

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl, & J. Beckmann, *Action control: From cognition to behavior* (pp. 11-39). New York: Springer Verlag.

Burgess, L., Cooper, J., & Sargent, J. (2008). Optimizing User Acceptance of Mandated Mobile Health Systems (MHS): The ePOC (Electronic Point-of-Care) Project Experience. *Proceedings from 21st Bled eConference eCollaboration: Overcoming Boundaries through Multi-Channel Interaction* (pp. 1-12). Kranj: Moderna založba.

Carlsson, C., Hyvonen, K., Repo, P., & Walden, P. (2005). Adoption of Mobile Services across Different Technologies. *Proceedings from 16th Bled eCommerce Conference: eIntegration in Action.* Kranj: Moderna založba.

Carroll, J. (2006). 'What is in it for me?': Taking m-Government to the People. *Proceedings from 19th Bled e Conference: eValues.* Kranj: Moderna založba.

Collan, M., & Tetard, F. (2007). Lazy User Theory of Solution Selection. *Proceedings from the CELDA 2007 Conference* (pp. 273-278). Algarve: IADIS.

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., & Warshaw, P. (1989). User Acceptance of Computer Technology: A Comparison of Two. *Management Science , 35* (8), 982-1003.

Georgiadis, C. K., & Manitsaris, A. (2005). Personalization of User Interfaces in e-Commerce and m-Commerce Applications. *Proceedings from IADIS International e-Commerce Conference 2005* (pp. 195-202). Porto: IADIS.

Hundal, B. S., & Jain, A. (2006). Adoption of Mobile Banking Services in India. *The ICFAI Journal of Systems Management , 4* (2), 63-72.

Jansen, V., & Zeef, P. (2006). Vision and Valuation of Citizen-Centric Shared Information Portal. *Proceedings from 19th Bled eConfernce: eValues.* Kranj: Moderna založba.

Jošanov, B., Marošan, Z., Jošanov, I., & Tomić, R. (2007). Multi-channel Organization of NBS Student Information System: Adoption of "e" & "m". *International Conference e-Society 2007* (pp. 255-261). Lisbon: IADIS.

Kargin, B., Basoglu, N., & Daim, T. (2009). Factors affecting the adoption of mobile services. *International Journal of Services Sciences , 2* (1), 29-52.

Keen, P. G., & Mackintosh, R. (2001). *Freedom Economy.* New York: Osborne/McGraw-Hill.

Khalifa, M., & Shen, K. N. (2006). Determinants of m-Commerce Adoption: an Integrated Approach. *Proceedings from European and Mediterranean Conference on Information Systems EMCIS 2006.* Alicante: EMCIS.

Leskinen, S. (2008). Mobile technology in the Finnish construction industry - present problems and future challenges. *Proceedings from 21st Bled eConference eCollaboration: Overcoming Boundaries through Multi-Channel Interaction* (pp. 13-24). Kranj: Moderna založba.

Lindsay, G. (2000). An answer in search of a question: Who wants m-commerce? *Fortune , 142* (9), 398-400.

Liu, Y., Deng, Z., & Wang, B. (2007). An Empirical Study on Chinese Enterprises; Adoption of Mobile Services. *Proceedings from International Conference on Wireless Communications, Networking and Mobile Computing 2007* (pp. 3629-3632). Los Alamitos: IEEE.

Mallat, N., Rossi, M., Tuunainen, V. K., & Oomi, A. (2008). An empirical investigation of mobile ticketing service adoption in public transportation. *Personal and Ubiquitous Computing , 12* (1), 57-65.

Nickerson, R. C. (2008). "Whither Wireless? Future Directions in Mobility". *Communications of the Association for Information Systems , 23* (1), 333-350.

Pedersen, P. E., & Ling, R. (2003). Modifying adoption research for mobile The Internet service adoption: Cross-disciplinary interactions. *Proceedings of the IEEE 36th Annual International Conference on System Science.* Hawaii: IEEE.

Pedersen, P. E., Nysveen, H., & Thorbjørnsen, H. (2007). *Adoption of Mobile Services. Model Development and Cross-Service Study.* Retrieved September 21, 2010 from IKT - Universitetet i Agder: http://ikt.hia.no/perep/cross_service_jams.pdf

Rogers, E. M. (2003). *Diffusion of innovation* (5th ed.). New York: The Free Press.

Shim, J. P., Varshney, U., Dekleva, S., & Nickerson, R. C. (2007). Wireless Telecommunications Issues: Cell Phone TV, Wireless Networks in Disaster Management, Ubiquitous Computing, and Adoption of Future Wireless Applications. *Communications of the Association for Information Systems , 20* (1), 442-456.

Shin, D. H., & Kim, W. Y. (2008). Applying the Technology Acceptance Model and Flow Theory to Cyworld User Behavior: Implication of the Web2.0 User Acceptance. *CyberPsychology & Behavior , 11* (3), 378-382.

Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. *Decision Sciences , 39* (2), 273-315.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science , 46* (2), 184-204.

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

Vos, H., Haaker, T., & Teerling, M. (2008). Consumer Value of Context Aware and Location Based Mobile Services. *Proceedings from 21st Bled eConference eCollaboration: Overcoming Boundaries through Multi-Channel Interaction* (pp. 50-62). Kranj: Moderna založba.

Wang, Y. S., & Liao, Y. W. (2008). Understanding Individual Adoption of Mobile Booking Service: An Empirical Investigation. *CyberPsychology & Behavior , 11* (5), 603-605.

Xu, Z., & Yuan, Y. (2009). The impact of context and incentives on mobile service adoption. *International Journal of Mobile Communications , 7* (3), 363-381.

Zhang, D., Adipat, B., & Mowafi, Y. (2009). User-Centered Context-Aware Mobile Applications - The Next Generation of Personal Mobile Computing. *Communications of the Association for Information Systems , 24* (1), 28-46.

Petar Vrgović
University of Novi Sad
Faculty of Technical Sciences
Trg Dositeja Obradovića 6
21000 Novi Sad
Serbia
Email: petvrg@gmail.com

Ivana Jošanov - Vrgović
Modern Business School, Belgrade
Jove Ilića 154
11000 Belgrade
Serbia

Email: ivana_josanov@yahoo.com

Borislav Jošanov
Higher School of Professional Business Studies, Novi Sad
Vladimira Perića Valtera 4
21000 Novi Sad
Serbia
Email: borislavjosanov@sbb.rs