

Increasing organization's overall performance through mobile technology. Albania case study

Erdet KËLLIÇI¹

***Abstract.** Information, performance and cost saving are the key elements in which organizations are investing money, energy and efforts. Any organization wants to offer the best tools to its employees and also wants to increase its efficiency by making them work offsite. In this study I will analyze the impact of the mobile technology implementation to end users and their behavior toward it. Part of this study shows how this technology helps the organization to reduce its impact on the environment and its operational costs. This study shows how users from different ranges of age and education react to mobile technology and analyzes the overall performance of these users and the processes related to their daily operation. Mobility of field employees is the key for increasing the organization's overall performance, as well as the quality of data and it helps the organization to better manage its resources.*

***Keywords:** mobile technology; performance; employee; environment; Albania.*

Introduction

Nowadays, mobile devices are not limited just to send SMSs and make phone calls; they are used for different purposes like navigating the web, checking emails, playing etc. Mobile devices' capacity of storing and processing information has increased a lot, and different operating systems have made these devices easy to use for almost everyone, no matter his/her age or education.

“Native mobile applications make user interface transitions and interactions generally smoother” (Wroblewski, 2011, pp. 14-18) due to their direct access into handheld resources. All these features make mobile technology a suitable tool in order to replace the old PC at the office. “The key feature of mobile computing technologies is mobility/portability” (Karahoca,

1. Lecturer, Ph.D. candidate, Department of Informatics, Statistics and Economics, European University of Tirana, Tirana, Albania, erdet.kellici@mpay.al.

2012, p. 27). Every manager can go out of office with his/her mobile device and access in real time all his office applications, Information Systems (IS) and e-mails from his/her mobile device. He/she can even authorize or initialize some important operation directly from his/her mobile device. This is possible due to the integration of mobile technology with other IS Components inside and outside the organization.

I consider mobility and convenience of the usage of mobile devices the key to the nowadays success and this is not just my opinion but it's also the opinion of many managers operating in the retail sector, banking sector, utility sector etc. In 2011 mobile devices overcame PC shipments worldwide and this trend is not going to change according to Gartner (Gartner, 2013).

Information and Communications Technology (ICT) budget is reduced a lot due to the current economic situation. The High Level managers in coordination with ICT Manager/s have to focus on how to spend this money in the most efficient way in order to increase the company's performance and decrease operational and maintenance costs.

Most of the organizations operating in Albania haven't embraced the mobile technology due to different reasons as mentioned below:

- The workforce is not expensive. Integration and automation of processes through mobile devices in general reduce workforce.
- Utilities' price is low (electrical energy, water etc.). Mobile devices consume less power than Personal Computers.
- Most of the high level managers are used to have his/her employees on site in order to control them.
- Mobile Devices, Mobile Technologies and Applications are relatively expensive, complex and need investments in order to integrate with existing IS and work processes.
- The high management of the organization focuses more on office workers rather than on field workers.

However, things are changing in Albania and now the mobile technology is turning in a must for some important organizations like CEZ Shperndarje, Posta Shqiptare etc. In this paper, I will show the study conducted by me in coordination with managers of the subject organization.

The company I'll present in this paper is CEZ Shperndarje, the only Albanian power distribution company. This company has more than 4,000 office employees and more than 650 field employees for reading the energy meters of its clients that are located all over Albania. The average age of a Meter reader is 47 and their education is at high school or lower level. CEZ Shperndarje has more than 1,200,000 active clients that should be visited by the readers once per month in order to get their monthly electrical power consumption. Also, these clients receive their bill every month, pay their bill every month and also they have the right to officially complain if the bill is not correct or mismatched. Due to this workload, the existing MIS system of CEZ Shperndarje is very complex and needs to be very accurate and updated with clients' data. Adding to that complexity is the fact that individuals with various skills and abilities are responsible for executing business processes by using mobile technology (Monk and Wagner, 2013, p. 56).

Literature review

The impact of ICT in today's organization on performance and qualitative terms has led to a wide range of studies. Some earlier analyses present contradictory evidence stating that there is a weak link or there is no link between ICT and performance (Weill, 1992; Brynjolfsson, 1993). Other studies (Baldwin, Sabourin and Smith, 2002, pp. 174-176) state that simply purchasing advanced technology does not lead necessary to success if they are not implemented correctly into the organization; the performance of enterprise is significantly increased only when they reengineer the business to strategically align with ICT (Henderson and Venkatraman, 1993). Furthermore, productivity growth is slowing down due to migration from production to information sector (Shu, 2003, p. 367).

Other studies (Brynjolfsson and Hitt, 1996, p. 557; Dewan and Min, 1997) indicate that there is a positive relationship between ICT and performance. Bresnahan et al. (2002) state that combination of ICT with organizational design increase productivity. Sarv Devaraj and Rajiv Kohli (2003, pp. 285-286) state that greater usage of ICT leads to better quality performance and financial results. Proactive attitude of Managers toward new technology will increase the impact and better results in organization (Gargallo-Castel and Galve-Górriz, 2007, pp. 51-52).

The technology allowing computing capability on the move using portable devices through wireless networks is mobile technology (Varshney and Vetter, 2000; Malladi and Agrawal, 2002). Importance of mobile technology is increasing in organization (Gayeski, 2002; Andersen et al., 2003). The main characteristics of mobile technology are mobility and reachability (Kim, Holmes and Mims 2005, p. 62; Karahoca, 2012, p. 27).

Methodology

My approach to identify the effect of mobile technology on employee performance is by taking several variable data before the implementation of mobile technology and after the implementation of the mobile technology. These data are measured again and the comparison between them shows the real effect this technology has on the organization of this case study. The organization studied in this paper is the biggest one in the energy sector in Albania.

In this study I focus on analyzing intangible and tangible benefits of mobile technology. I have studied and collected data from the biggest and the only electric power distribution company in Albania that has more than 4,000 employees where about 60% of them are working and gathering company data in the field.

Organization's Challenge

CEZ Shperndarje is the biggest company in Albania with more than 4,000 employees where 60% of them have no fixed working place and

about 17% of them collect data in the field every day. Before the company acquisition from CEZ Group, these data were manually collected not in electronic format and the operators updated the IS with these data manually. The biggest problem of the company 4 years ago was the reading of all the meters in one month. This was done using printed lists that were distributed to each reader for his/her zone. The readers read the meters, wrote the results on papers and sent these papers back to their managers. This was a very inefficient way for this operation because of the following reasons:

- The process of printing lists, delivering these lists to the meter readers, gathering lists back again, input the data of the list to billing system is time-consuming.
- Due to manual data entry from meter readers in their printed tables, and because of entering this information to the billing system by operators, there were a lot of human errors.
- Printing costs were high, and in this case the environment should be considered too.
- Processing the data in real time was impossible.
- Implementation of automated checks during data entry in order to warn the end user (Meter Reader) in case of big differences in reading was impossible.

There were two ways to change the situation for CEZ Shperndarje using New Technology approach:

1. The first option was to change all the existing meters with GPRS capability meters in order to get meter data online using a GPRS Mobile Network. This option was difficult to implement, with high costs and the project implementation time was too long. Thus, this option was not taken in consideration from the organization because of its difficulty to be implemented in a short period of time and because of its high costs.
2. The second option was a software implementation that uses Mobile Technology in order to read the meters online and send the data back to MIS Components in real time. By doing this, the organization expected to increase the efficiency of the reading process, reduce operation costs and decrease human errors by implementing logical checks for each reading.

Technical solution

The prerequisite of implementing Mobile Technology in order to integrate it with the existing IS components were as follow:

- The purchase of mobile devices for each employee in order to work in the field;
- Implementation of a Software running on this device that can send data to the IS in order to integrate Mobile Technology (MT) with IS;
- The selection of a Mobile Network Operator (MNO) that will provide real time connectivity between mobile devices and MIS system;
- The integration between Smart devices and IS system in order to exchange information with each other;
- The creation of a central database in which the information will be sent directly by mobile devices and that can also be accessed from all users. “This database minimizes data entry errors and provides accurate information in real time to all users” (Monk and Wagner, 2013, p. 184).

The Smart Device selected for this purpose was Motorola PDA MC55 with a Windows Phone 7 operating system. This device is shown in Figure 1.



Figure 1. Motorola MC55 Device

The technical specifications of the device are as follows:

- Bluetooth and 802.11a/b/g connectivity with flexible VoIP;
- 2 megapixel auto-focus flash-enabled optional color camera with decode capability;
- Multiple voice and data capture modes;
- 3.5 inch high definition QVGA color display;

- Available with a Magnetic Stripe Reader;
- Bar Code Reader/GPS/Camera.

“It is not acceptable to take a PC screen design and merely cut it to size to fit a PDA screen” (Buttle, 2009, p. 409) and in order to achieve this, specialized software is needed. The software selected to integrate mobile technology with IS components was programmed by Kvados Company and this software is called myAvis. Data connection between PDA devices and IS components located in the main office server was offered by MNO Albania Mobile Communications (AMC). The integration between PDA and IS was made by Kvados Company in collaboration with the CEZ Shperndarje ICT Team. In Figure 2 is shown the interaction between different myAvis components.

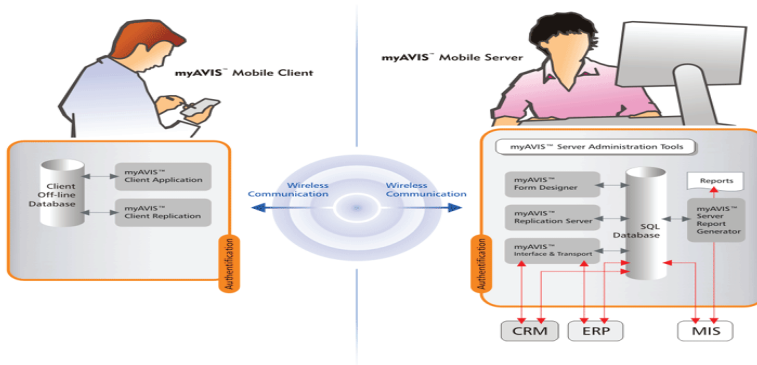


Figure 2. Process of communication among systems/ Kvados, a.s., MyAvis ecosystem

Information security is one of the key elements that the organization has to take in consideration during mobile technology implementation and integration with the existing IS. In this case, the MNO offered the first level of security regarding network issues by separating the public network from the organization’s network by using a dedicated APN. Further to this physical separation of networks, the software itself offered dedicated authentication through a username and a password for each employee working in the field. Also, the software limited the amount of data that a handheld device can contain. Due to this limitation, the mobile user had

to synchronize its handheld data with the central system and during this synchronization the data was removed from the handheld device. In case of a lost handheld device, only a small portion of data could be found into the handheld device's database because of this limitation.

Data analyses

The data shown in this study are gathered in two stages of the mobile project implementation and integration with IS and business processes:

- The situation before implementation of the new system that uses mobile technology and integrates the reading process with the components of IS.
- Eighteen months after the implementation of the new system that uses mobile technology and integrates reading process with the components of IS.

These are the results of my analyses two months after the reading through mobile device method was implemented:

Table 1 and Table 2 show respectively the data belonging to the Meter Reading Department before Mobile Reading was introduced and after the implementation of mobile reading through Motorola MC55 and myAvis system.

Table 1. Data of MR Department before MT Implementation (CEZ Shperndarje, ICT, HR and Meter Reading Departments)

Description	QTY	Unit
Total Number of Meter Readers	704	Persons
Printed Pages for reading purpose	227,270	Pcs
Operators for data entering	57	Persons
Information exchange frequency/ per Meter Reader	4	Times/Month
Meter Readers visits at respective main offices	2,860	Times/Month

Table 2. Data of MR Department eighteen months after MT Implementation (CEZ Shperndarje, ICT, HR and Meter Reading Departments)

Description	QTY	Unit
Total Number of Meter Readers	586	Persons
Printed Pages for reading purpose	4,000	Pcs
Operators for Data assignment and analyses to Meter readers	44	Persons
Information exchange frequency/ Per Meter Reader	40	Times/Month
Meter Readers visits at respective main offices	586	Times/Month

The data shown in Figure 3 changes several parameters in MR Department between the two periods of data analysis and in this report I have listed the findings:

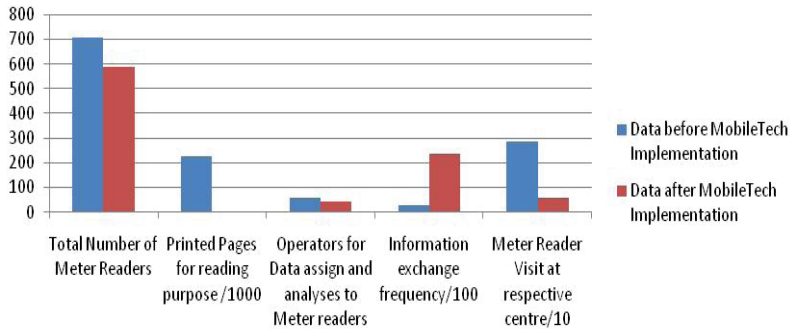


Figure 3. Data comparison between two stages of the project

The number of Meter Readers decreased by 118. The readings of all clients finished in expected time. The project implementation influenced directly better resource planning. Also because of the CRM information located on PDA, readers used the working time more efficiently. The number of pages printed every month for reading purposes decreased by 56.8 times after the implementation of myAvis project. The operation costs on distributing and printing the reading lists were reduced. Also, the company had less impact on the environment by reducing printings.

The number of operators was reduced, but on the other side data analysts who were used to load the daily data for meter readers to myAvis system replaced them. Data analysts were used for analyzing and checking meter readers' performance and data quality. In this case, the costs weren't reduced, but the quality of data increased due to more frequent and real time controls performed by data analysts.

Information exchange between meter readers and centers increased 8.3 times. The synchronization between meter readers and myAvis system was done twice a day using mobile devices. Before myAvis implementation, the information was exchanged 4 times a month for each meter reader and also the information, after being taken from the meter reader to the main regional office, was entered manually by the operators in the main billing system. After the implementation of myAvis, the data were synchronized directly from mobile devices to the billing system without the need of the operators. The information after myAvis' implementation was updated in real time using mobile technology. This process increased the quality of data and reduced operation costs.

Each week the meter readers had to go to the meter reading center in order to deliver the readings and get the empty list for the next week reading. In rural areas this increased the costs for the company due to transportation costs and also affected directly the working hours of the meter readers due to the long distance between reading centers and meter reader area. After the implementation of myAvis the meter readers received the clients' data directly to their mobile device and after reading, they sent them back to the system using GPRS Connection provided by the MNO.

Perception of mobile technology by employees

This analysis shows that the new technology affected directly the operation costs, the performance, quality of data and environment. But how did workers, in this case meter readers, react to this new technology?

Most of the meter readers had no experience with smartphones and personal computers. Also, at the beginning of the project, meter readers were not enthusiastic about the change in the traditional way of doing their daily job. However, later on, the mobile device was the main tool

for them and they were happy to use it. In order to see how meter readers reacted to the new technology, I have made another analysis to find out the end user's reaction to the new technology.

Table 3 and Table 4 show the data of the survey conducted by me in collaboration with CEZ Shperndarje ICT department and CEZ Shperndarje Meter Reading Division in two different stages of mobile technology implementation/integration with the existing IS and processes.

Table 3. The survey data two months after the introduction of mobile technology (CEZ Shperndarje, ICT Department)

Description	QTY	Unit
Phone calls for technical support in the ICT Department	113	Phone Calls/ Month
Satisfaction of meter readers regarding the new technology	3	0-10
Number of visits of meter readers to ICT Department	40	Time/Month
Average speed for entering a single reading in PDA	180	s/record

Table 4. The survey data eighteen months after the introduction of mobile technology (CEZ Shperndarje, ICT Department)

Description	QTY	Unit
Phone calls for technical support in ICT Department	17	Phone Calls/Month
Satisfaction of meter readers regarding the new technology	7.50	0-10
Number of visits of meter readers to ICT Department	7	Time/Month
Average speed for entering a single reading in PDA	50	s/record

The data in Figure 4 shows the reaction of the employees toward the mobile technology and mobile devices based on the user's performance, satisfaction and technical problems encountered during working processes.

During the first months after myAvis was implemented there were different kind of problems regarding the new technology. The problems that appeared at this stage of the project were technical and psychological.

Due to the analyses of the data listed above I have listed the following findings.

At the beginning of myAvis project the frequency of the phone calls for technical support from mobile users were frequent. This phone calls were frequent because of these reasons:

- The end users had no experience with mobile device and mobile technologies.
- The end users had no experience on using myAvis software.
- ICT Department had no experience on supporting mobile device and mobile technology.
- The end users where not confident regarding the data entry to the mobile device.

After 18 months, I conducted the same survey and the number of phone calls was reduced by 6.6 times. This means that the end users and ICT department where confident with the new technology.

At the beginning of myAvis project the average time for entering an entry in the mobile device was about 180s. This was not acceptable from the management and the normal time asked from them was 70s in order to meet the readings deadline. In order to have a better performance, the management started to push the readers to increase the speed of entering the data to their mobile devices. After 18 months the data analyzed showed that the average time for entering a single entry in the mobile device was 50s. This shows that the meter readers have increased their performance due to experience, confidence and due to the easy way of interacting between them and mobile technology.

Meter readers didn't trust mobile technology at the beginning of myAvis project due to their little experience with this devices and also because of the new way of interaction between them and the billing system. Now, they are

directly responsible for the data they send to the system. So during the first survey, two months after myAvis implementation, they were not satisfied with the new technology and the whole reading process. After 18 months of usage of mobile technology and meeting management requirements, meter readers change the perception toward mobile technology. They were confident with it and also managed their working hours and met their deadlines faster and in a more efficient manner than before. During the second survey they looked satisfied with the new technology and the new way of interacting with the system.

The visits of meter readers to the ICT Department for technical support decreased because of their experience and confidence gained during the working period with mobile devices and mobile applications.

Green IT implementation

Green IT is the conscious implementation of technologies, techniques and policies designed to reduce the carbon footprint of the IT function within the organization. Mobile technology is helping us to implement Green IT in the organization. This case study's data has shown that printing pages were reduced drastically by implementing mobile technology in a specific division of CEZ Shperndarje. In Table 5 and Table 6 we can calculate power consumption for 1 hour for desktops, laptops or thin clients (<http://michaelbluejay.com/electricity/computers.html>). In this case study, most of fixed position employees were using desktops and total power consumption for 1 hour is:

$$\begin{aligned} & \textit{Conventional Desktop PC(no power management)} + \textit{LCD Monitor(19 inch)} \\ & = 110W + 50W = 160W/h \end{aligned}$$

Battery specifications for the PDA used by the organization are: Rechargeable Lithium Ion 3.7V, 3600 mAh Smart Battery (Motorola). A full recharge of the battery takes two hours with a 40W charger that means that for a single full recharge of PDA are needed 80w. With one recharged battery the employee finishes its 8h working day most of the times and according to the survey I conducted in this organization, the

performance of the battery is good for 2 years, so we can consider that the battery lifecycle for this devices is 2 years. The cost of the battery is about 45\$, that means that we have an extra cost of 22.5\$ per year. By comparing costs of energy for each of the two elements that the organization is using, we can say that in a year, that has approximately 260 working days, a PDA consumes 20.8 kW and a PC consumes 332.8 kW. In Albania 1kW costs about 12c, that means that a PC consumes about 39.93 euro/Year and a PDA consumes 2.5 euro/Year. If we apply the cost of the battery 20 euro/Year, then we can say that the cost for the PDA on power consumption plus battery purchase is 22.5 euro/Year.

Table 5. Power consumption without Monitor		Table 6. Power consumption of Monitors	
System Unit Type	Power Consumption (Watts)	Monitor type	Power Consumption (Watts)
Conventional Desktop PC – no power management	110W	Conventional CRT monitor - 19 inch	140W
Conventional Desktop PC – power management	90W	Conventional CRT monitor - 17 inch	80W
“Green PC”	80W	LCD Monitor - 19 inch	50W
Laptop PC	60W	LCD Monitor - 17 inch	30W
Notebook PC	40W	OLED Monitor	10W
Thin Client	15W		

Source: Michaelbluejay (2013)

In one shift a single user consumes $160W * 8 = 1.28$ kW/d and this is the best case scenario because some users may work more than 8 hours and many other won't shut down their PC when they leave the office. By implementing mobile technology the data will flow from PDAs, tablets or mobile phones to the organization servers, and as a result of this new way of data flow after implementing mobile technology, the number of back office operators will decrease and this is not valid only for the organization studied in this paper, but for almost all organizations that have back office operators that gather data from mobile users and enter those data to their

system. Mobile technology will reduce the number of back office operators and also, since the data is in electronic format, the number of printers and printing pages will decrease. Mobile technology helps the organization to reduce its operation costs and help it to be more green and friendly toward environment.

Conclusions and limitations

Mobile technology is very complex and affects the organization processes and employees. Based on the data analyze, I have identified two key findings:

-Employee: Mobile technology is not easily accepted by employees and the performance using these tools was very low at the beginning but with the time employees increase their expertise on using the device and software. In this specific study I noticed by analyzing the data that employee performance on data entry is increased by 3.6 times in 18 months (Devaraj and Rajiv Kohli, 2003). Due to technology 16% of employees in Meter Reading department were laid off, according (INSTAT, 2013) in Albania the unemployment rate was 15.6% at 2013 (INSTAT, 2013), by taking this in consideration the new technology had negative effect on employment for the specific case.

- Environment: Mobile technology helps us to be more responsible toward the environment by reducing energy consumption, printed papers, fuel consumption and decreases the quantity of raw material needed for building a single device in comparison with desktop PC. In this study I found that printed paper for specific department was decreased by 56.8 times and power consumption was decreased 16 times.

This study is conducted in a single utility company in Albania for a two year period, and does not contain cross-sector data source comparison of others companies in Albania or region. This limits the study in analyzing specific effects of this technology between organizations.

This study offers empirical evidence on this topic by analyzing a wide range of data in a country where mobile technology is perceived as a need rather than an opportunity. The research in the sector will be extended in

the future and will analyze cross-organization data regarding the impact of mobile technology in organization's performance and data quality.

References

- Andersena, K.V., Fogelgren-Pedersena, A., and Varshneyb, U. (2003). Mobile Organizing Using Information Technology (MOBIT). *Information Communication and Society*, 6(2), 215-228.
- Baldwin, J.R., Sabourin, D., and Smith, D. (2004). *The Interaction between ICT, advanced technology use and human resource competencies, The economic impact of ICT*. OECD.
- Brynjolfsson, E. (1993). *The Productivity Paradox of Information Technology: Review and Assessment*. Communications of the ACM.
- Brynjolfsson, E., and Hitt, L.M. (1996). Beyond Computation: Information Technology, Organizational Transformation and Business Performance. *Management Science*, 42(4), 541-558.
- Buttle, F. (2009). *Customer Relationship Management: Concepts and Technologies*. Burlington, MA: Elsevier.
- Dewan, S., and Min, C. (1997). The Substitution of Information Technology for Other Factors of Production: A Firm Level Analysis. *Management Science*, 43(12), 1660-1675.
- Devaraj, S., and Kohli, R. (2003). Performance Impacts of Information Technology: Is Actual Usage the Missing Link?. *Management Science*, 49(3), 285-286.
- Gartner (2013). *Worldwide Devices Shipments by Segment*. Retrieved from <http://www.gartner.com/newsroom/id/2408515>.
- Gargallo-Castel, A., and Galve-Górriz, C. (2007). Information Technology, Complementarities and Three Measures of Organizational Performance: Empirical Evidence from Spain. *Journal of Information Technology Impact*, 7(1), 43-58.
- Gayeski, D. (2002). *Learning Unplugged*. New York: AMACOM.
- IINSTAT (2013). Retrieved from http://www.instat.gov.al/medial/237073/tregu_i_punes_2013.pdf.
- Henderson, J.C., and Venkatraman, N. (1993). Strategic Alignment: Leveraging Information Technology for transforming organizations. *IBM System Journal*, 32(1), 198-221.
- Karahoca, A. (2012). *Advances and Applications in Mobile Computing*. Published by InTech, PP 27 -30, April.

- Kim, S.H., Holmes, K., and Mims, C. (2005). Mobile Wireless Technology Use and Implementation. *TechTrends*, 49(3), 54-63.
- Malladi, R., and Agrawal, D.P. (2002). Current and future applications of mobile and wireless networks. *Communications of the ACM*, 45(10), 144-146.
- Michaelbluejay (2013). *How much electricity do computers use?* Retrieved from <http://michaelbluejay.com/electricity/computers.html>.
- Monk, E.F., and Wagner, B.J. (2013). *Concepts in Enterprise Resource Planning*, Fourth Edition. Boston, MA: Cengage Learning.
- Shu, W. (2003). *Information Technology Investment, Economic Growth, and Employment*. 7th Pacific Asia Conference on Information Systems. Adelaide, Australia, July 10-13, 2003.
- Varshney, U., and Vetter, R. (2000). Emerging mobile and wireless networks. *Communications of the ACM*, 43(6), 78-81.
- Weill, P. (1993). *Strategic information technology management: Perspectives on organizational growth and competitive advantage*. Hershey: IGI Publishing Hershey.
- Wroblewski, L. (2011), *Mobile first*. Ingram.
- http://www.motorolasolutions.com/web/Business/Products/Mobile%20Computers/MC55/_Documents/Static%20File/MC55-FAMILY-Spec-Sheet-1109-web.pdf.