

# Development and Analyses of Mobile E-Commerce Software Application

Majlinda Fetaji and Bekim Fetaji

**Abstract**—The focus of this research is to analyze the development and usage of mobile e-commerce software, as well as to quantify its business operations benefit. The effects of globalization in business companies and the latest developments in Information Technology, Internet and outsourcing, are changing the way businesses are operated and managed. Findings regarding the development perspective and usage performance while taking into account user productivity, business process cost reduction, technology cost reduction, increased revenues and staff productivity, have been stated and recommendations are provided. The contribution of the research study based on, and taking into consideration the research study outcomes, are the positive insights for improvement of business operations of many companies in the region, as well as the fact it can become a good reference point for further researches in mobile e-commerce technology field.

**Keywords**— M-commerce, mobile devices, business application, business benefits.

## I. INTRODUCTION

THE effects of globalization in business companies and the latest developments in Information Technology, Internet and outsourcing, are changing the way businesses are operated and managed, having their continuous tendency to achieve a competitive differentiation, operational excellence and flexibility in adapting to the highly changing business conditions. Companies are composed of large number of branch locations, becoming distributed, with their employees using IT complex applications, in increasingly mobile environment.

Mobile technology intends to alter the ways business is conducted, by evolving rapidly over the past years and representing the future of computer technology and computing. Mobile devices go far from being no more a simple cellular phone, but a complex device with GPS navigation system, embedded web browser, and industrialized mobile software.

Adoption of mobile technology is becoming the newest challenge for an enterprise and provides room for new applications, in order to be on the competitive edge and

increase the productivity.

Incorporating mobile devices into business operations of companies is in its early stages in Macedonia, Balkans region and wider region. This may be due to insufficient knowledge and information about mobile communication technology field, and not being aware of the potential of these devices to improve the overall business performance of the company.

## II. CONCEPTUAL DESIGN

The conceptual design and the goal of the software is the following: to make possible for mobile employees to make orders, invoices, payments for their clients on the go, and with this to overcome the manual processing of orders afterwards when they get back from the field. By this, they increase their efficiency, by saving time, being more responsive to clients needs, cutting off employee expenses, etc.

Data are transferred both from the device to the main system and vice versa. From the mobile device by synchronization documents made such as orders, invoices, payments, etc, are sent to the main system. Data which are needed for operating with the mobile application are transferred from the main system, and they include: Clients, Items, Item groups, Pricelists, Routes, etc.

This mobile software needs to be incorporated into an ERP system in order to be functional. Naturally, it's connected to "Mecom" ERP; however, easy implementation with any ERP system is possible, due to the data abstraction and standards used in database design.

The business logic behind this functionality is as follows: After logging in, the user can make orders or any types of other documents which are previously filtered only for that specific Pocket ID, One commercialist can have many routes which need to be visited and taken orders from. Each route is named according to city names or days of the week, and it contains a specific list of clients participating in that route.

After having chosen the option to make an order, the first step is choosing the type of the document, client and a specific object for that client. This information is crucial for an order or invoice, and the system won't allow continuing further on without completing it. Next step is selecting the items which should appear in the order or invoice. Each of them needs to have quantity, so that the final amount is calculated. Further on, the method of payment is chosen, and by this the document is ready to be sent do the base system.

Generating reports as functionality is of crucial importance for the commercialists. At each time, they can generate

Majlinda Fetaji, is with the South East European University, Faculty of Contemporary Sciences and Technologies, Ilindenska bb, 1200 Tetovo, Republic of Macedonia, (phone: 00389-76-397-679; fax: 00389-44-356-001; e-mail: m.fetaji@seeu.edu.mk).

Bekim Fetaji, is with the South East European University, Faculty of Contemporary Sciences and Technologies, Ilindenska bb, 1200 Tetovo, Republic of Macedonia, (phone: 00389-71-381-384; fax: 00389-44-356-001; e-mail: b.fetaji@seeu.edu.mk).

different kinds of reports which help them into checking their activities. Type of reports include: inventory in depot, inventory in van, sales, and daily sales.

The reports showing the inventory are useful since the commercialist needs at any time to know the available inventory for sale or order in the depot or at his van, so he can make appropriate orders. Inventories are filtered according to item groups or items solely. Sales report gives the sales made for a specific client, whereas daily sales gives a list of the sales made at the current day.

### III. THE DEVELOPMENT PERSPECTIVE

The development environment of “Mecom” Mobile e-commerce application is Visual Studio .NET IDE, which includes native support for programming with SQL Server. Smart device projects provide a data designer and code behind mode, which helps in better management of application development and maintenance following recommendations from [1], [2].

The main actors of the process are: Publisher, Distributer and Subscriber. Snapshot Agent creates snapshots for each partition of data published, and through the Merge agent, the initial snapshots are applied to the Subscribers. After generation of the initial snapshot, Merge agent becomes alert to incremental data changes that occur at Publisher or Subscribers, and detects conflicts as necessary.

This mobile application is mainly used for making orders and van sales. As mentioned before, “Mecom” Mobile is suitable to be implemented along with any ERP system, since it has clearly defined structure and interface. In order to make order or a sale for a client in field, the application needs some pre-existing data to be loaded. These data come from the ERP system, which can be at the same server, or different that the application’s database server.

Pre-defined data include information about the routes of sale, clients for each route, types of documents which can be made (orders/reservation/invoice/Credit-memo), and list of clients available for each route, items and item groups along with their pricelists.

As long as this data is present in “Mecom” Mobile database, then the pocket pc will synchronize and get the most updated data. After login, the user is asked for synchronization, which may be accepted or postponed for further on. The commercialist chooses the specific route he wants, and then the main menu form appears.

It has menu buttons for each functionality mentioned above: Documents, Reports, Counting kilometers, Synchronization and Choosing routes.

It has menu buttons for each functionality mentioned above: Documents, Reports, Counting kilometers, Synchronization and Choosing routes.

After choosing Document from the main menu, as shown in the figures below, the user needs to provide values for Document, Client and Object fields, which are considered to be the head of the document. The method of choosing values

for each of them is similar, the user from the lookup menu is given a list of possible choices, and he picks up the appropriate one. First of all, type of document is chosen, which may be one of these: ORD, ORIG, ORIL, PL, A INV, etc, depending on the company’s working documents. Similarly, by clicking at the client and object lookups, list of clients and a corresponding list of objects for that client are provided. The user selects a client/object by clicking Accept button, or denies it with Deny correspondingly.



Fig. 1 User Interface

### IV. INSIGHTS

In order to obtain the business benefits of using mobile software in a corporate, two kinds of research methods are used: 1) Surveys (questionnaires and interviews) and 2) Observations

These research methods are conducted at companies which already have been using this mobile software and have incorporated it into their daily business activities.

While choosing the target companies, several factors have been taken into consideration such as: the variety of industries in which the companies belong, both midsize and large companies, having different number of employees ( ranging from 30 to 280), different time frame using the software, etc. There are 5 companies in total in which the surveys are conducted, belonging to different type of industry: 2 of them into distribution of goods, 2 into sales and production, and one into the meat production and sales industry. Due to ethics and privacy, their names will not be made published, instead they will be named with letters correspondingly.

Identification of impact of the mobile software in overall, according to [1], [2] has to deal both with user experience of the software, as well as management evaluation, therefore 2 kinds of surveys are designed, as described below.

1) End-User Survey: This survey’s purpose is to explore and observe the user experience while working with mobile

devices that contain the above mentioned software. In total 30 employees from 5 different companies answered this survey, each with different backgrounds and experience into the business. Questions [4] focus on the process of making orders, the number of orders made and delivery, identification of time factor as a benefit and numbering the errors which are possible if not using the software. Finally, the users are given the possibility to give feedback and ideas for improving the software to meet their needs.

IT Manager Survey - Except obtaining feedback from the user experience while using the mobile software, each companies IT manager is conducted a different survey, in order to evaluate the efficiency of the employees. 5 IT Managers answered this survey, each having different experience and expectations from using the software. Questions are focused on employees efficiency in terms of time and productivity, identification of the business activities and steps involved in making an order, the contribution of the software into companies competitive advantage on the market, by making comparisons of the processes with and without using "Mecom"

As can be seen from the results above, each question's answer is calculated in percentage and in figurative form. According to the results, a high percentage of 73% of the employees actively use "Mecom" software into their daily work activities, mostly making 10 to 20 orders per day (53%).

Making orders using "Mecom" saves the employee's time; about 67% of the users spent 15-25 minutes to make an order manually, whereas doing the same order using the software spends those 5-10 minutes. Most of the employees send the orders immediately for processing into their base system, however some of them do this at the end of the day, or whenever a stable connection with the server is provided. 80% of them have a GPRS connection, while others send their orders using Wi-Fi network of the company, at the end of the day.

They have admitted that when making the orders manually, the most common errors which are encountered are item quantity and item inventory information (50%), whereas incorrect item prices are encountered for 37% of them. This clearly indicates that "Mecom" helps decrease the number of crucial errors with high possibility of occurrence without using it. Along with using the mobile software for making orders, employees use other applications which reside into their mobile devices, including Internet Explores (67%), MS Outlook and Calendar application.

At the other hand, the managers of a company have an overall image of the performance of a company, as well as the performance and efficiency of each employee separately. The results obtained from their survey are discussed below. 3 out of 5 companies are using this mobile software for more than 3 years now, and all 5 of them are generally satisfied with the performances and the functionalities provided.

Using "Mecom" effectively contributes in increasing the employee's performance and efficiency while doing their work activities, and to this agrees most of the surveyed

managers, 60% of them choosing the scale 4 from total 5. This fact is also supported by their answers when listing the activities needed for completing an order. Most of them agree that using "Mecom" cuts off the steps of making an order (2 or 3 steps less) and 1 or 2 employees less needed to further on process the order. Number of errors which can be made by completing orders manually is decreased when using "Mecom", since IT managers as well confirm this by choosing the scale 4 out of 5, at the corresponding question. The managers strongly believe that using the mobile software has helped them achieving a competitive advantage at the market in the appropriate industry where they operate. However, they still have their own concerns and issues, which need to be considered in order to improve the functionalities of "Mecom".

Previous researches have shown that the growth of mobile applications is driven by the same factors that are driving IT and business process change, meaning the need to be more efficient while using staff and resources, shorten the time of processes throughout the chain, and answer in a more responsive manner the needs and requirements of clients. Industry mobile applications have extended various ERP systems, by replacing some parts of the processes with mobile functionality, or otherwise said, they facilitate one or more processes associated with a particular industry. For example, in fields of production planning, inventory management or logistics, an industry mobile application can bring information from the field faster and more efficiently, leading to increased responsiveness and improved decision making for the higher management.

The increasing intensity of competition in every industry is another driving factor of mobile applications [4], since the importance of integrating business processes and makes them more efficient, is more than obvious. In the case of "Mecom" software, the results of the surveys conducted showed that the driven factors are satisfied. Namely, responsiveness to customers is increased by making the orders at the time of visit; the efficiency of staff resources is increased by spending less time making an order with the software then before, and several steps from the process chain are shortened, due to automatic order delivery and process. Other key drivers of mobile applications remain the evolution of technology itself, as well as the improvements in mobile devices security.

Many organizations apply mobile technology and mobile applications into their work activities to processes where the integration of real-time information can improve the process quality. Process quality would mean achieving better decisions while working on field, faster decisions and shortening cycles by completing the gap between the field and office work.

The companies chosen to do the survey are mid-size or large companies for this region (more than 50 employees), and they have successfully implemented a sample mobile application such as "Mecom" into their business processes, increased their overall performance and efficiency of the field work and have apparent business benefits.

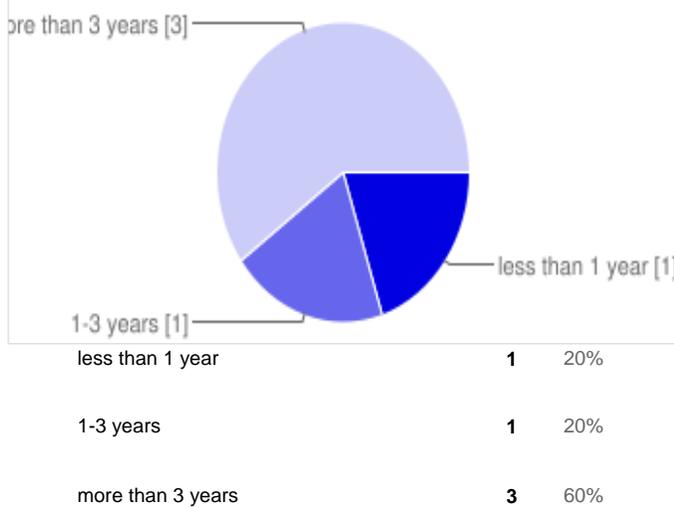
V. RESULTS FROM EVALUATION

TABLE I  
COMPANY DETAILS THAT FILLED IN  
THE SURVEYS

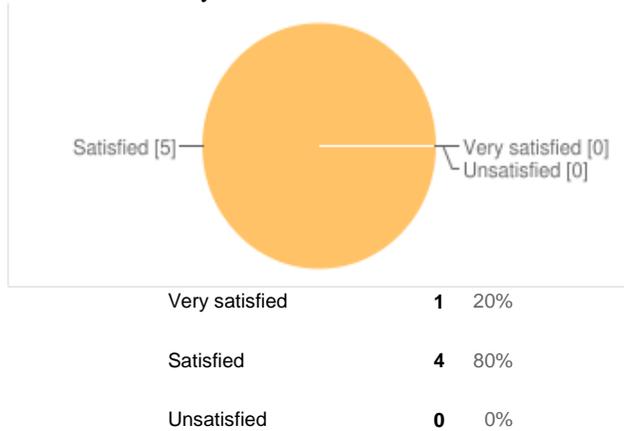
Name of company	Year of foundation	Type of industry	Total nr of employees	Nr of employ on field
A	2003	Sales and Distribution	30	8
B	1989	Sales and Distribution	50	7
C	1992	Wholesaler	35	5
D	1990	Meat Industry	283	6
E	1995	Wholesaler	45	4

VI. SURVEY QUESTIONS AND RESULTS

1. Time period using "Mecom" ?



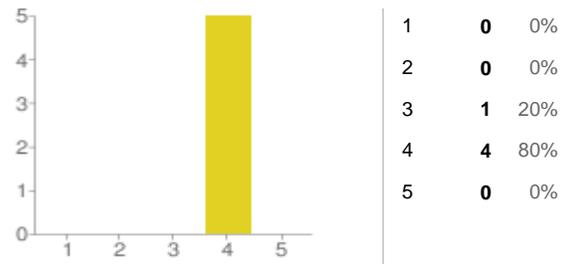
2. How satisfied are you from the functionalities this software offers to you?



3. How much the software does contribute on increasing the efficiency of your employees on field? (From 1 to 5)



4. How much the software does contribute on decreasing or eliminating the possible errors while making orders MANUALLY (from 1 to 5)?



5. How much time is needed to make an order manually? Which activities are included in this process, and the number of employees included?

Activities:

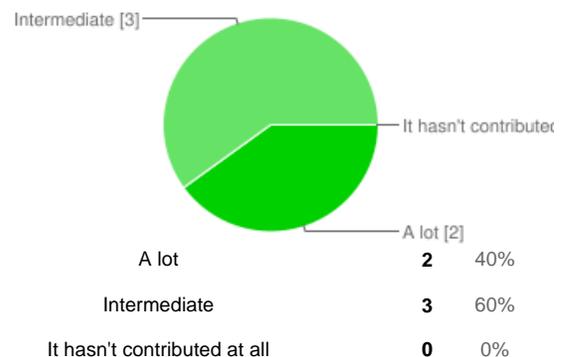
1. Visiting a client
2. Completing an order
3. Sending by fax or orally by phone
4. Registering the order into an ERP system

Number of people included is at most 2 or 3, whereas the time needed depends on the size of the order. An additional phone or fax line is included.

6. How many steps from the process of manually making orders are decreased if you use "Mecom" ? Which ones are they?

Steps 3 and 4 from the question above are cut off, meaning the order is made, send and processed automatically, no need for additional phone line or person to register it into the ERP system.

7. How much the software does contribute on making your company more competitive on the market?



8. What would you change or improve at the software?

- *Speed of the mobile device*
- *Keeping track of the time visiting the client*
- *Keeping track of kilometers considering geographical coordinates.*
- *Additional client information to be displayed at the mobile software.*
- *Reducing not necessary steps.*

TABLE II

ANOVA RESULTS BY GROUP AND GENDER AND THEIR INTERACTIONS FOR POST TEST

Source of Variation	Sum of squares	df	Mean Square	F Value	Sig.
Group	154.957	1	154.957	16.745	0.000
Gender	83.912	1	83.912	3.088	0.073
Pre-Test	2504.207	1	2504.207	81.130	0.000
Group pre-Test	137.960	1	137.960	5.078	0.027
Error	1712.649	33	27.169		
Total	6069.809	37			

\* $p < 0.05$ , \*\* $p < 0.001$ 

Each participant entered a pre-test with the objective to be able to assess the increase in their skills caused before and after the use of the software. Significant differences were found between the experimental group and the control group,  $F(1,63) = 16.745$ ,  $p < 0.001$ , with these varying in accordance with the pre -Test scores, as can be seen in the significant interaction Group\* pre-Test,  $F(1,63) = 5.078$ ,  $p = 0.027$ .

## VII. CONCLUSION

Adapting user interface according to user requirements is a key addressing issue when it comes to challenges of mobile applications. Some of the top reasons why still native applications are preferred, are explicitly the ability to build a superior user interface accessing device hardware as well as well established distribution channels.

In order to address these issues, the web mobile development has already started to be a strong competitor.

Next generations web technologies are targeting the user interface as well as native device features, such as GPS, accelerometer, address book, camera, local storage, etc. Mobile technology shifts towards unified clients (web browsers) and cloud services on the backend.

As conclusion stressing out the issues intercepted from the end users that the speed of their devices needs to be improved, as well as the steps which lead those to complete an order should be shortened, in order for them to save time and resources. At the other hand, the managers of a company have an overall image of the performance of a company, as well as the performance and efficiency of each employee separately. The results obtained from their survey are discussed below. 3 out of 5 companies are using this mobile software for more than 3 years now, and all 5 of them are generally satisfied with the performances and the functionalities provided.

Using "Mecom" effectively contributes in increasing the employee's performance and efficiency while doing their

work activities, and to this agrees most of the surveyed managers, 60% of them choosing the scale 4 from total 5. This fact is also supported by their answers when listing the activities needed for completing an order. Most of them agree that using "Mecom" cuts off the steps of making an order (2 or 3 steps less) and 1 or 2 employees less needed to further on process the order. Number of errors which can be made by completing orders manually is decreased when using "Mecom", since IT managers as well confirm this by choosing the scale 4 out of 5, at the corresponding question. The managers strongly believe that using the mobile software has helped them achieving a competitive advantage at the market in the appropriate industry where they operate.

The results of the surveys conducted showed that the driven factors are satisfied. Namely, responsiveness to customers is increased by making the orders at the time of visit; the efficiency of staff resources is increased by spending less time making an order with the software then before, and several steps from the process chain are shortened, due to automatic order delivery and process.

Functionality changes, such as the ones recommended by the end-users and IT managers include the following: new item choosing methodology while making an order (possibility to select many items simultaneously), and inserting for each the appropriate quantity, all in the same window; decreasing the number of steps while making an orders, commenting some of the confirmation boxes, keeping track of kilometers made by the user while visiting each client; additional client information, etc. The insights of the research study can be used for further development of such mobile software systems that will help companies and organizations to achieve better business results using mobile e-commerce applications.

## REFERENCES

- [1] Fetaji M. Fetaji B., (2008), "Universities go Mobile", Case Study Experiment in Using Mobile Devices" In the proceedings of ITI 2008-30th International Conference on Information Technology Interfaces, Cavtat, 23-26 June 2008, pp (123 - 128).
- [2] Ebibi M, Fetaji B. Fetaji, M. (2012). "Combining and suporting Expert Based Learning and Academic Learning in Developing Mobile Learning Knowledge Management System", Journal TEM, Technology Education Management Informatics, ISSN: 2217-8309, Volume 1, Number 1, 2012, Association for Information and Communication Technology Education and Sciences, Serbia.
- [3] Lovrekovic, Z, Lovrekovic, T. (2012). "Software Application for Managing Multidisciplinary and Interdisciplinary Studys as a Part of Educational Process", Journal TEM, Technology Education Management Informatics, ISSN: 2217-8309, Volume 1, Number 1, 2012, Association for Information and Communication Technology Education and Sciences, Serbia.
- [4] Koivumaki, T. Ristola, A. and Kesti. Predicting consumer acceptance in mobile services: empirical evidence from an experimental end-user environment. International Journal of Mobile Communications, 4(4): 418-35. M. (2006).
- [5] B. Unhelkar. Handbook of research in mobile business: technical, methodological, and social perspectives. IGI Global snippet, 2009.