

# WEB TECHNOLOGY IN MOBILE ORGANIZATION MANAGEMENT

**Anna Soltysik-Piorunkiewicz**

**Summary:** The paper describes the new paradigm of mobile enterprises with applying Web technology solutions. The author shows development of Web technology for mobility in enterprises and characterizes the areas of mobile organization management model. The author shows the study results conducted for purpose of findings the new challenges in developing Mobile Web applications due to literature review. The aim of review was to discover the main areas of research and development of Mobile Web application for management and organization. Method used in the study of literature review is based on the data available in the databases of Thomson Reuters publications in Web of Science™ Core Collection, MEDLINE®, KCI-Korean Journal Database, SciELO Citation Index.

**Keywords:** mobile organization, mobile enterprise, mobile Web technology, enterprise mobile application

## 1. Introduction

Mobile technology, web application development and universal access to the Internet contribute to the change in the management and conduct of business organizations both in business and in its surroundings. Companies expanding their activities fit their capabilities to meet the needs of the market. Both small and large organizations using Web 2.0 solutions can adapt more flexibly, easily and effectively to changing business conditions. The mobile way to access the Internet and mobile applications introduced next revolution in the way the organization. However, the continued use of mobile technology in the organization of a new challenge to providing a competitive advantage, improve profitability and efficiency [1]. To this end, attempts are made to develop appropriate management models in a mobile organization [2].

The aim of this article is to present the role of Web technologies to manage mobile organization. The research shows the current business challenges in developing Mobile Web applications due to literature review.

## 2. Web technology development

Information technologies are in rapid development, especially in terms of Web technologies. From a historic point of view 1990 is the official year of birth of the commercial Internet, which was available to the general public. Since this date a lot has changed and a lot of technical and infrastructural evolution can be seen. Internet before the 1999 are called the “Read-Only” web, which means that the average web user’s role was bounded to reading the information which was presented to him in a static way. The sites were completely not interactive and static; the user which once visited the site and consumed the information had no more reasons to visit the site again in further time. Such model is called the Web 1.0 and defines the approach in which first websites has been

created. The steady commercial growth of the Internet is often called the Internet Boom which was continuing through the 1990s and resulted in the founding of a group of new Internet-based companies commonly referred to as dot-coms. The collapse of the boom began at the 1999, when some companies completely failed. It was caused because of the lack of interactivity and static content offered by the Web 1.0. Web 2.0 has started emerging for this issue.

Web 2.0 can be a set of approaches and practices that provide Web users with a deep and rich experience. On the other hand it can be also a new collection of applications and technologies which makes it easier for people to collect the information and connect online with one another. In the late 1999 the O'Reilly Media publisher coined the term Web 2.0 to describe the new Web environment that emerged after the Internet Boom crash. Despite that there still wasn't a clear definition of Web 2.0. In September 2005, Tim O'Reilly posted a blog entry that defined Web 2.0. Philosophy of Web 2.0 includes following ideas [3]:

- Using the Web as an application platform.
- Democratizing the Web.
- Employing new methods to distribute the information.

In the period of the Internet Boom the Web companies focused on providing a product. These products would then serve as the foundation for a suite of applications and other products. Vision of the O'Reilly regarding the Web 2.0 company is one that provides a service rather than a product. Good example of such company is Google. Google's value comes from following factors:

- Multi-platform service – Google can be accessed on a PC, Mac, Mobile device etc.
- Avoids the business model established the software industry – no need to buy a software package to use the service.
- Includes a specialized database of information (search results).

Another current important part of Web as a Platform development is rich user experiences which are based on a dynamic content and Web applications that are responsive to user input. It could be developed in mobile organization management. Enterprise mobile applications become "role-based applications," as companies design them for specific roles and functions in the organization. Technologies for mobile enterprise application platform are vastly improved with an opportunity for cloud based or on-premise solutions; native, hybrid, or mobile Web applications [4].

Cross platform mobile Web applications [5] would bring enormous benefits to business users to write-once-run-anywhere applications for a wide variety of mobile devices. By using HTML tools and a mobile application development platform, developers can write once and deploy to multiple platforms instantly. Thin client approach and Web standards help to achieve high ROI from the mobile application, as there is only server side component development and testing of application on different browsers. In case of thick clients, there exists a need to have application development efforts both at the server side and client side; thus increasing the overall development and deployment cost. Mobile Web solutions address the typical business use-case to improve operational efficiency of mobile workforce by automating job scheduling, assignment, approval workflow and intelligent reminder/alerts triggered on cross platform devices. Applications developed using Web standards are easy to maintain and update, resulting in low TCO for mobile Web applications in a long term. The existing Mobile Web standard tools would rapidly integrate mobile applications with back-end and legacy applications and maximize the usability and

flexibility of mobile applications. Always available mobile Web applications generate a higher rate of return due to the fact that users spend more time being productive with the application. Such mobile application would be using "always available architecture" which clearly meant that users can access databases, applications and Web content quickly and easily on their mobile devices all the time. Interactive mobile web applications development would make potential customers, interested and connected, leading to increased sales. Collaboration tools would give them the feeling that they are a part of business eco-system. Using smart caching and advanced synchronization techniques, mobile Web applications would deliver a seamless user experience across a variety of public and private wired and wireless networks [6].

### **3. Mobile organization management**

The past Web technology was playing a crucial role in deciding on, how and where to access information, but today, customer want to gain the operational and cost advantages of deploying rich mobile applications over the Internet [7]. Mobile communication systems revolutionized the way people communicate [8]. But the mobile enterprise management is following a structured process to analyze an organization's manufacturing-related processes and systems in order to prioritize and aggregate the features and functionality of the role-based mobile apps [6]. Mobile organization management focuses on resource management, transaction management, workflow management, decision-making, knowledge management and reporting.

Transaction management includes processes for mobile data entry, mobile alerts, early warning systems, process management using mobile applications. Workflow management is focused on the use of mobile applications for the implementation of mobile orders, scheduling and resource allocation, access to information and the use of mobile applications mobile ERP and CRM applications. Resource management focuses on human resources, management, technical assets and services. Decision-making in a mobile organization is supported by mobile intelligent decision support systems, mobile expert systems, mobile systems, Business Intelligence and Competitive Intelligence. In the area of Knowledge Management mobile applications are used primarily for monitoring and tracking of knowledge, application of knowledge, search knowledge and knowledge creation. In the report the most attention in mobile applications is paid to the form and design of dashboards (visualization reports), sales analysis, monitoring time and cost of using mobile BI.

Mobile Web, not only brings a paradigm shift in the way the business applications are developed, delivered and consumed, but also changing the way, the businesses serve their customer [7]. Mobile organization should not be associated with a small window of the display device on which it will be launching a mobile app, but with the change of management resulting from the opportunities offered by mobile technologies.



Fig. 1. Mobile organization management model

Model of mobile organization management in the field of mobile strategic, operational and tactical primarily is based on the assumption of the availability of the organization to the Internet using the devices to ensure the use of the wireless Internet and mobile technology and applications (Fig.1). The purpose of the use of mobile technology in the organization is to increase its value, create a competitive advantage, improve profitability and efficiency. Managing mobile organization is based on several important pillars, namely: mobile sales, mobile marketing, mobile workers, mobile sales representatives, mobile knowledge management. The use of mobile BI, mobile CRM, mobile ERP, and further develop systems of mobile banking and mobile payments are going to be implemented. SFA solutions (ang. Sales Force Automation), supporting the work of sales representatives, allow you to use the software in a way to automate business sales job, with the help of mobile devices, including tablets and smart phones. Such solutions support mobile workers, for example traders working away from headquarters, clients implementing payments and transfers away from the bank's headquarters [9]. Systems using SFA are usually used in conjunction with mobile CRM and mobile ERP [1], [10], and support processes, i.e.:

- order processing,
- contact management / customer relationship,
- exchange of information,
- inventory control,
- tracking of orders,
- analysis and sales forecasts,
- planning and controlling the work of the sales team.

#### 4. Research methodology and results

The research was based on literature review. The aim of review was to discover the main areas of research and development of Mobile Web application for management and organization. Method used in the study of literature review is based on the data available in the databases of Thomson Reuters. Based on a literature review of publications in Web of Science database™ Core Collection, MEDLINE®, KCI-Korean Journal Database, SciELO Citation Index, query was performed issues related to "mobile enterprise"(ME) and "mobile organization" (MO), and then "Enterprise 2.0" (E 2.0) and "Web 2.0". The example of a literature review of mobile enterprise publications in Web of Science™ Core Collection database shows the figure 2.

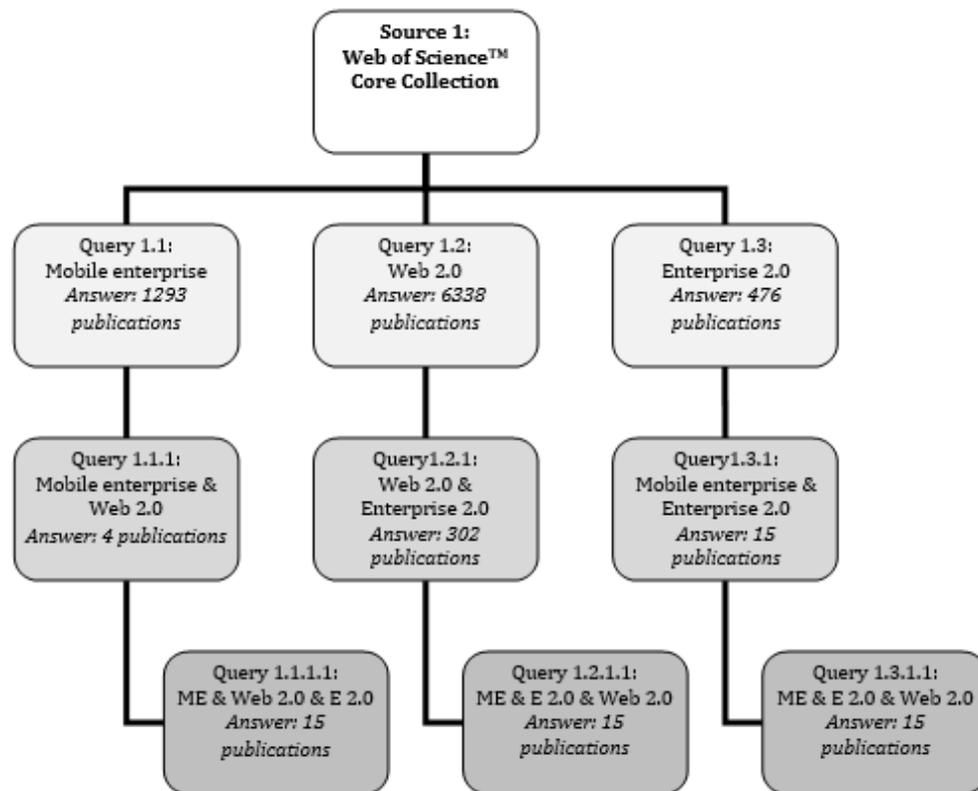


Fig. 2 Research methodology: the example of a literature review of mobile enterprise publications in Web of Science™ Core Collection database as a source

As a result of the search, the following responses to the list of queries point due to common research areas:

- Computer science.
- Business economics.
- Engineering.
- Telecommunications.

The study of literature review was conducted in January 2015. The effect of study was shown in table 1.

Table 1. The study of literature review: No. of publication: Mobile enterprise, mobile organizations, Enterprise 2.0, Web 2.0.

	ME	MO	E 2.0	Web 2.0	ME & Web 2.0	ME & Web 2.0 & E 2.0	ME & E 2.0	Web 2.0 & E 2.0	ME & MO
<b>Web of Science</b>	1 293	4 146	476	6 338	4	15	302	15	149
<b>MEDLINE®</b> ,	53	3 506	30	3 836	No results	No results	1	No results	16
<b>SciELO Citation Index</b> ,	9	39	7	103	0	0	0	3	4
<b>KCI-Korean Journal Database</b>	124	171	40	566	3	3	20	5	10

The examples of research categories findings are shown in the tables 2-9.

The results of searching term of “**Mobile enterprise**” in Web of Science™ Core Collection database are shown 1293 publications in following Web of Science categories (Table 2):

- Computer science information systems.
- Engineering electrical electronic.
- Telecommunication.
- Computer science theory methods.
- Computer science interdisciplinary applications.

Table 2. The top of Web of Science categories for “**Mobile enterprise**”

<b>Web of Science: Mobile enterprise</b>	<b>No. of publication</b>
COMPUTER SCIENCE INFORMATION SYSTEMS	385
ENGINEERING ELECTRICAL ELECTRONIC	327
TELECOMMUNICATIONS	297
COMPUTER SCIENCE THEORY METHODS	285
COMPUTER SCIENCE INTERDISCIPLINARY APPLICATIONS	173
<b>Sum</b>	<b>1293</b>

The results of searching term of “**Mobile organization**” in Web of Science database™ Core Collection are shown 4146 publications in following Web of Science categories (Table 3):

- Computer science information systems.
- Engineering electrical electronic.
- Telecommunication.
- Computer science theory methods.
- Computer science artificial intelligence.

Table 3. The top of Web of Science categories for “**Mobile organization**”

<b>Web of Science: Mobile organization</b>	<b>No. of publication</b>
COMPUTER SCIENCE INFORMATION SYSTEMS	685
ENGINEERING ELECTRICAL ELECTRONIC	672
TELECOMMUNICATIONS	616
COMPUTER SCIENCE THEORY METHODS	489
COMPUTER SCIENCE ARTIFICIAL INTELLIGENCE	403
<b>Sum</b>	<b>4146</b>

The results of searching term of “**Mobile organization**” in **KCI-Korean Journal Database** are shown 171 publications in the top following **KCI** categories (Table 4):

- Business administration.
- Computer engineering.
- Engineering.
- Electrical informational engineering.
- Design.

Table 4. The top of KCI-Korean Journal Database categories for “**Mobile organization**”

<b>KCI-Korean Journal Database: Mobile organization</b>	<b>No. of publication</b>
BUSINESS ADMINISTRATION	29
COMPUTER ENGINEERING	19
ENGINEERING	11
ELECTRICAL INFORMATIONAL ENGINEERING	11
DESIGN	11
<b>Sum</b>	<b>171</b>

The results of searching term of “**Mobile organization**” in **KCI-Korean Journal Database** are shown 124 publications in the top following **KCI** categories (Table 5):

- Business administration.
- Computer engineering.
- Engineering.
- Design.
- Trade.

Table 5. The top of KCI-Korean Journal Database categories for “**Mobile enterprise**”

<b>KCI-Korean Journal Database: Mobile enterprise</b>	<b>No. of publication</b>
BUSINESS ADMINISTRATION	22
COMPUTER ENGINEERING	20
ENGINEERING	16
DESIGN	9
TRADE	6
<b>Sum</b>	<b>124</b>

The results of searching term of “**Mobile organization**” in **MEDLINE Database** are shown 3506 publications in the top following **MEDLINE** categories (Table 6):

- Health care science services.
- Psychology.
- Public environmental occupational health.
- Telecommunication.
- Sociology.

Table 6. The top of MEDLINE categories for “Mobile organization”

<b>MEDLINE: Mobile organization</b>	<b>No. of publication</b>
HEALTH CARE SCIENCES SERVICES	2327
PSYCHOLOGY	723
PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH	684
TELECOMMUNICATIONS	460
SOCIOLOGY	486
<b>Sum</b>	<b>3506</b>

The results of searching term of “**Mobile enterprise**” in **MEDLINE Database** are shown 53 publications in the top following **MEDLINE** categories (Table 7):

- Health care science services.
- Computer science.
- Telecommunication.
- Medical informatics.
- Information science library science.

Table 7. The top of MEDLINE categories for “Mobile enterprise”

<b>MEDLINE: Mobile enterprise</b>	<b>No. of publication</b>
HEALTH CARE SCIENCES SERVICES	33
COMPUTER SCIENCE	23
TELECOMMUNICATIONS	17
MEDICAL INFORMATICS	15
INFORMATION SCIENCE LIBRARY SCIENCE	9
<b>Sum</b>	<b>53</b>

The results of searching term of “**Mobile enterprise**” in **SciELO Citation Index** are shown 9 publications in the top following **SciELO Citation Index** categories (Table 8):

- Engineering multidisciplinary.
- Management.
- Engineering manufacturing.
- Computer science software engineering.
- Business finance.

Table 8. The top of SciELO Citation Index categories for “**Mobile enterprise**”

<b>SciELO Citation Index</b>	<b>No. of publication</b>
ENGINEERING MULTIDISCIPLINARY	2
MANAGEMENT	1
ENGINEERING MANUFACTURING	1
COMPUTER SCIENCE SOFTWARE ENGINEERING	1
BUSINESS FINANCE	1
<b>SUM</b>	<b>9</b>

The results of searching term of “**Mobile organization**” in **SciELO Citation Index** are shown 39 publications in the top following **SciELO Citation Index** categories (Table 9):

- Public environmental occupational health.
- Management.
- Nursing.
- Engineering multidisciplinary.
- Urban studies.

Table 9. The top of SciELO Citation Index categories for “**Mobile organization**”

<b>SciELO Citation Index</b>	<b>No. of publication</b>
PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH	10
MANAGEMENT	5
NURSING	3
ENGINEERING MULTIDISCIPLINARY	3
URBAN STUDIES	2
<b>SUM</b>	<b>39</b>

## 5. Conclusions and future research

The most of publication are in the engineering and business economics research areas. The result of research on mobile business should become a model of mobile information system architecture of the organization in the future. On the basis of the literature identified the following areas of development in the mobile economy [11], [12], [13], [14], [15]:

- Mobile commerce.
- Mobile banking.
- Mobile payment.
- Mobile advertising.
- Mobile marketing.
- Mobile HR management.
- Mobile Sales Force Automation.
- Mobile Knowledge Management.
- Mobile targeting.

Nowadays the mobile targeting is very common in research publication and is closely related to the context of marketing theory and relates to the use of mobile technology to reach out to the target consumers at the right time and place. An example study conducted by a group of researchers from the US and China [15], conducted in 2013 was based on a large-scale randomized experiment, which involves sending short text messages (SMS) to 12 265 mobile phone users. In response, confirming the results obtained using the increase in purchases, sales promotion strategy on mobile phones for one day before and one day sending mobile promotion. The results confirmed the hypothesis that the time and place of receipt of the information on a cell phone to take a positive effect on consumer purchasing decisions. The closer to the consumer purchases was the more purchases were carried out, also increased its commitment and intention of purchasing. Sending text messages one day before the promotional campaign or on the same day is more than nine-fold increase in consumer purchases over the use of communication strategies with two days in advance. These results suggest that knowledge of when, where and how will be a promotional campaign is crucial for mobile sales strategy. Marketers can save costs by careful design campaigns targeting their customers with mobile phones.

Behavioral aspect [16] is also examined in terms of confidence in the functionality of mobile banking and mobile payments. Analysis of mobile banking services and mobile payments is mainly carried out using models IDT, UTAUT, TAM and ELM [16], [17], [18], [19], [20], [21]. Conducted research leads to conclusions about factors affecting the willingness to use banking and payment mobile applications. These are mainly the factors related to the provision of mobility to the user, easy handling services, security, usability, and matching application needs. There are some areas of future research in mobile organization management [22], [23], [24]:

- Virtual presence and virtual navigation.
- Tele-Medicine and e-healthcare.
- Tele-geoprocessing applications as a combination of GIS (Geographical Information System) and GPS (Global Positioning System).
- Education for people who are interested in lifelong education, they anywhere in the world can continue their education through online in a cost effective manner.
- Artificial Intelligence with artificial sensors which could be communicated with mobile phones.
- Travelling with integrated smartphones in the passenger travel process.
- Security in mobile and cloud applications with the function of authentication, authorization, encryption, establishment and implementation of service policy agreement between the various vendors.
- Crisis management and economic growth supported with technology changes allowing consumers and businesses to benefit from high-value wireless data and content services.

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Dr inż. Anna SOŁTYSIK-PIORUNKIEWICZ  
 Katedra Informatyki  
 Uniwersytet Ekonomiczny w Katowicach  
 40-287 Katowice, ul. 1 Maja 50  
 tel./fax: +48 32257-7277  
 e-mail: [anna.soltysik-piorunkiewicz@ue.katowice.pl](mailto:anna.soltysik-piorunkiewicz@ue.katowice.pl)