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EVOLUTION IN THE FUNDAMENTAL AREAS OF THE BUSINESS OPERATION OF POLISH COMPANIES RELATED TO THE APPLICATION OF MOBILE TECHNOLOGIES

Summary: Mobile technologies are one of the most important stimulants of changes within the fundamental areas of company operation. The changes are manifested, among other things, in such areas as internal and external communication, and in the organic functions of economic entities. This paper aims to identify the scope of such changes brought about by the introduction and use of mobile technologies. Based on questionnaire studies, this paper presents an analysis and evaluation of the current trends in the use of mobile technologies in the above areas. The findings are used to formulate a set of recommendations on the effective application of mobile technologies in the economic practice of Polish companies.

Keywords: mobile technologies, internal communication, external communication, organic functions of economic entities.

1. Introduction

Modern companies, in striving for innovation, seek new strategies of development. One of the most promising strategies in the context of business opportunities is the introduction of mobile technologies. Mobile devices and wireless data transmission methods offer an unparalleled integration of both centralized and dispersed business structures. This approach not only helps businesses respond promptly to the needs and the expectations of the market, but also offers increased flexibility in the realization of the organic functions of the company. Mobile platforms are gradually replacing traditional structures, becoming a sort of communication/information core – this is perhaps the most radical manifestation of the business response to new technologies.

This paper aims to present the evolution in fundamental areas of company operation brought about by the introduction of mobile technologies, followed by an analysis and evaluation of the current trends in the application of mobile technologies

in the above areas, for the purpose of formulating recommendations on the effective use of mobile technologies in the business practice of Polish companies.

2. The characteristics of mobile technologies

In an attempt to define mobile technologies, it may be useful to refer to the definition of technology which can be defined as the purposeful application of information in the design, production, and utilization of goods and services, and in the organization of human activities [BusinessDictionary 2013]. Mobile technology may be defined as the provision of mobile solutions, products/appliances and services/software, with mobility interpreted as freedom of the user's movement or the ease of carrying the device in question (portability). Thus, mobile technologies can be defined as ones that may be used freely, irrespective of time and space constraints.

The most significant features of mobile technologies include the following [Grantham, Tsekouras 2005; Gebauer, Shaw 2004]:
– directness and instantaneity of contact,
– connectivity,
– potential to report the present location of the mobile device user, via geolocalization technologies,
– vice portability and data synchronization across devices,
– uniqueness and personalization of mobile devices.

The ubiquitous mobile devices, with their multimedia capabilities, have already transformed our lives, offering new qualities. The former postulate of "always online" has not only been fulfilled, but also enhanced by the significant quality of "online everywhere" [Kutera, Łysik 2013].

In this context, it may be interesting to note that, for example:
– in 2012, the sales figures for mobile tablets in the US and China surpassed those of laptop computers; in 2013 this trend will be global [Mashable.com 2013];
– according to Ericsson Mobility research, the number of smartphone devices sold in Poland in the third quarter of 2012 constituted more than 50% of cellular phones, overall [*Rewolucja mobile…* 2013];
– of the 1.07 bn active users of Facebook social networking website, 470 mil accessed their account from mobile devices [*Facebook's…* 2013].

The most important components of mobile technologies include, as mentioned above, mobile devices, mobile operating systems and wireless data transmission technologies.

The mobile devices subgroup is quite diversified, from relatively large notebook devices powered by traditional operating systems, with computing power comparable to that of desktop computers, through medium-sized ultrabooks, netbooks and tablets, to more compact devices – mobile phones and smartphones, powered by dedicated mobile operating systems. The utility of mobile devices is largely related to their battery capacity. The most significant characteristics in this context is their

diminished computing power, compared to that of desktop computers, since the processing potential is artificially reduced to save power consumption, as the available power-up solutions are still lacking in this respect.

The most popular mobile operating systems include Android (designed by Google), iOS (Apple) and Windows Phone (Microsoft). Other companies have gradually entered the mobile OS market, with the most notable examples being Firefox OS (Mozilla) and Tizen (Samsung). All the above operating systems are designed around similar software architecture, offering increased modality through optional mobile apps, but they differ in their approach to source code openness policy.

Wireless data transmission technologies, on the other hand, differ widely with respect to traffic capacity (throughput) and coverage. The most popular technologies include the widest-coverage GSM standard and its subsequent generations with increased throughput, such as GPRS, UMTS, HSDPA, and LTE, followed by near field communication technologies, such as WLAN/Wifi, and Bluetooth. The GPS standard remains the most popular geolocalization technology.

Mobile users have great freedom in their choice of basic mobile technology components. This allows them to tailor the mobile communication ecosystem[1] to their needs and conditions of use, not only for personal use, but also for commercial and business applications.

3. The impact of mobile technologies upon fundamental areas of business operation in Polish companies

Analytical examination of the impact of mobile technologies upon business operation requires the determination of three basic operating areas, namely: internal communication, realization of the organic business functions, and external communication.

Company internal communication involves the exchange of information (information flow) within the organizational structures, i.e. communication between employees, and that between management and employees. Realization of company organic functions pertains to such areas as marketing, logistics, sales, production, and customer service. External communication encompasses company communication with business partners, financial institutions, local and state administration, and customers.

Proper and effective information flow, as offered by modern mobile technologies, is of fundamental importance for the functioning of both internal and external

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[1] The term "ecosystem" refers to the dynamic structure which consists of an interconnected population of organizations, or of only one organization, and operate, is characterized, like biological ecosystem, by a large number of loosely interconnected participants who depend on each other for their mutual effectiveness and survival [Peltoniemi, Vuori 2004].

communication processes. It is also one of the most potent determinants of change within fundamental areas of company operation (Table 1).

Table 1. Evolutionary changes within fundamental areas of business operation, resulting from the introduction of mobile technologies.

Area		Area characteristics	
		without support of mobile technologies	with support of mobile technologies
1		2	3
Internal communication		• paper flow of documents • electronic communication limited by access to desktop devices • individual communication via land-line telephones • mass communication via bulletin boards, multimedia panels, etc. • the need to organize frequent meetings and discussions	• electronic flow of documentation via personal mobile devices • wide range of individual communication methods via mobile devices and mobile communication apps • personalized mass communication, with messages pushed to individual mobile units • potential for setting up remote conferencing and remote training sessions • instant communication with field operatives
Company organic functions	Marketing	• wide circle of recipients • the dominance of 'push'-type messaging • limited potential for message personalization • reduced potential for message tracking and feedback measurement • high cost of message transmission	• narrow, precisely defined groups of recipients • focus on interactive, 'pull'-type communication • geolocalization as an element of message personalization • extensive capability for message tracking and feedback measurement • low cost of message transmission
	Logistics	• car fleet management and driver management via paper documentation or electronic documentation • reduced potential for fleet/freight security, control and tracking • inventory management via paper and electronic documentation	• dynamic fleet management and driver management, enhanced by GPS technology, with great potential for route optimization and on-demand route adjustment • great potential for fleet/freight security, control and tracking • support for inventory management through QR codes and RFID tags
	Sales	• proper management of sales processes requires access to desktop devices or point-of-sale equipment • control of sales tasks through manual analysis of paper documentation or electronic databases	• full, real-time management of sales processes from remote locations • control of sales processes through personal mobile devices • customers may finalize purchases through personal mobile devices, independent of time and location

Table 1, continued

1		2	3
Company organic functions	Sales	• limited potential for personalization of sales offers • payments realized using traditional or electronic methods, requiring access to desktop devices	• personalized sales offers, pushed directly to customers' personal mobile devices • full management of mobile payment methods
	Production	• production employees are required to be present at their work posts at all times • control processes realized in person or through desktop devices • limited potential for fast response to crisis situations in production processes • measurement readings require direct access to measurement devices	• greater independence and mobility of production teams • remote control and optimization of production processes • increased capability of fast response to crisis situations in production processes • remote reading of measurements, maintenance-free analysis and control of field measurement devices
	Customer service	• limited potential for personalization of customer service processes, • customer services require access to point-of-sale equipment • access to company services and customers determined by time and location	• highly personalized customer service processes • potential for remote servicing of customers, both pre- and post-sale • intelligent management of customer communication, non-invasive and highly personalized • no time and space constraints with regard to access to company services and customers
External communication		• communication with external environment partially constrained by time and space • poor selection of communication channels • interactions limited to traditional media, with greatly reduced real-time capabilities	• external communication practically free from time and space constraints • individualization of the communication processes • wide selection and great variety of communication channels, offering a wide range of utility features • communication is interactive and conducted in real time

Source: own research.

As shown in Table 1, mobile technologies have a considerable impact on all ba-sic areas of business operation, mainly through independence from traditional time and space constraints, increased mobility of employees and a wide selection of com-munication channels. Mobile devices free their users from the traditional constraints of desktop access to the Internet, thus improving the potential for message persona-lization in customer servicing and improving the overall quality of communication processes.

In this context, it is worth noting that mobile technologies, like any other innovative solutions, may pose certain problems at implementation and operation stages. While the tasks of setting up remote access to mobile solutions and the provision of mobile devices are relatively straightforward, then the use of best communication practices, especially in the context of information security and ease of remote access, may be problematic. Therefore the introduction of mobile solutions may be burdened with the risk of making decisions under pressure of time, space and emotions.

It should also be noted that mobile technologies will never supplant the natural need for personal contact and rapport between business partners, nor will they ever replace the practice of individual relations on a personal level, with their power of support and conflict resolution. Nonetheless, mobile technologies will gradually become a part of the company ecosystem, integrating the areas of internal communication, external communication, and other organic functions of a modern company.

4. Analysis and evaluation of current trends in the use of mobile technologies for business purposes in the economic practice of Polish companies

The analysis and evaluation of current trends in the use of mobile technologies in Polish companies, presented herein, was based on the findings obtained in the course of research studies conducted at the end of 2012[2]. The body of research, among other things, helped identify the classes (groups) of mobile devices typically employed with respect to the areas of operation under study (Table 2).

Of all mobile device classes, the most frequent responses included cellular phones and laptops/netbooks, in line with general market structure data in the segment. It is also important to emphasize the dominant position of internal and external communication among the areas of mobile device application for each class under study. It is expected that standard mobile phones will be replaced by smartphones in the foreseeable future, as their popularity grows steadily.

Analytical examination of data transfer methods employed in individual areas of business operation shows the most popular use and development trends in this respect (Table 3).

In this respect, the two most widely used methods are: short-range wireless network (WiFi) and the GSM mobile standard (with its subsequent generations). The most notable finding here is the relatively low share of the contending methods, with the exception of Bluetooth technology employed for internal communication purposes. Again, the dominant areas of application are those of internal and external communication.

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[2] The research study "Mobile technologies in company business practice – identification, analysis, and evaluation", conducted in Nov./Dec. 2012, resulted in 159 records. The questionnaire form included 18 closed-type questions and one open-type question. The study was conducted by staff of the Department of Business Communication at Wroclaw University of Economics.

Table 2. The use of mobile device types in selected areas of company operation (in % of companies)

Mobile device class / Operation area	Mobile (cellular) phones	Smartphones	Laptops and netbooks	Tablets	GPS trackers	Navigation
Internal communication	68.00	18.87	53.66	10.71	3.33	1.67
Marketing	36.26	16.67	34.04	8.62	0.00	1.61
Supply chain	29.90	8.77	22.33	4.13	2.44	3.28
Production	15.60	6.78	17.76	3.28	0.80	0.00
Sales	40.91	21.15	33.33	6.78	0.81	7.69
Customer service (pre- and post-sale)	46.51	21.15	41.57	7.69	2.52	6.78
External communication	61.54	25.25	55.56	11.50	3.39	9.57

Source: own research based on study findings.

Table 3. The use of wireless data transmission methods in selected areas of company operation (in % of companies)

Data transfer method / Operation area	WIFI	GSM	Bluetooth	IRDA	RFID	Radio waves
Internal communication	46.99	34.04	21.15	0.80	0.80	3.28
Marketing	22.33	29.90	3.28	0.00	0.00	2.44
Supply chain	14.55	23.53	3.28	0.00	0.80	0.00
Production	10.53	13.51	1.61	0.00	0.00	0.00
Sales	27.84	32.63	5.00	0.00	0.00	1.64
Customer service (pre- and post-sale)	37.78	34.78	5.98	0.00	0.00	2.44
External communication	42.53	44.83	5.00	0.80	0.80	3.28

Source: own research based on study findings.

Mobile technologies are unique in the sense that they incorporate a high level of personalization with geolocalization capabilities. For this reason they can be readily employed in a variety of innovative, practical solutions. Research findings suggest that the most popular reasons for the use of mobile technologies are: the expected improvement of communication processes though the use of a time- and space-independent medium (over 84%), potential for remote work (over 65%), and the time and location-independent access to company resources (over 63%). These three areas are

largely determined by the portability of mobile devices, coupled with the continued capability improvements of mobile devices and components (such as the steady increase of computing power brought about by new generations of mobile central processing units), offering remote access and management of complex business operations and activities.

Another important premise for the growing use of mobile technologies is market pressure (46%), with customers expecting improved access to company representatives as well as innovative mobile services, such as mobile apps and NFC tags. In addition, mobile technologies offer improved adequacy, relevance and currency of information – this opinion was voiced by nearly 40% of responding companies. A similar percentage of responses was found with respect to cost optimization brought about by mobile technologies.

The research showed that over 71% of the companies studied perceived the introduction of mobile technologies as a good investment. Respondents saw both the positive (Figure 1) and negative consequences (Figure 2) of mobile technologies for business purposes. The most frequent merits voiced by the respondents included the improvement of external communication processes (90%) and that of internal communication (70%), which is in line with the earlier conclusion on the dominance of communication aspects in the evaluation of mobile technologies.
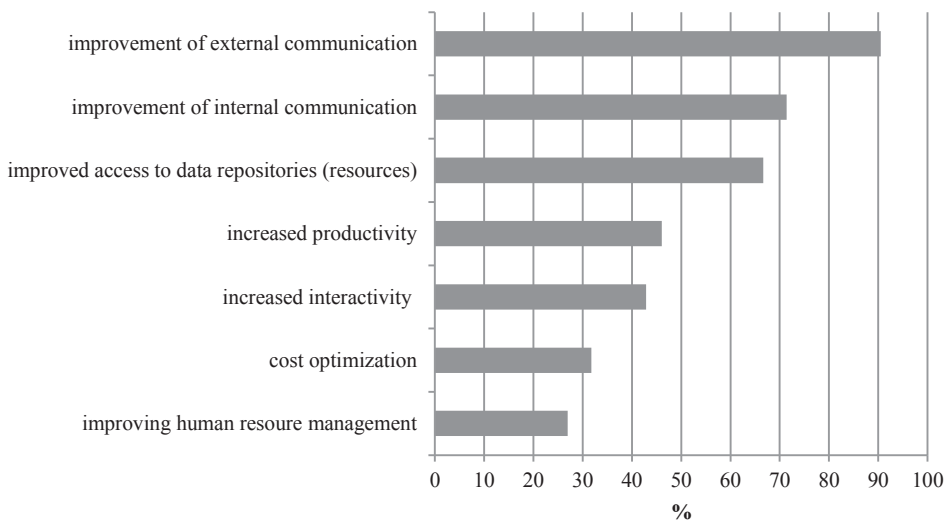

Figure 1. Merits of mobile technologies in the context of their business application (in % of companies)

Source: own research based on study findings.

In terms of the negative outcomes of new technologies, the most important conclusions included poor telecommunication infrastructure (signal range, throughput) and the imperfections of mobile devices – most of all, the low battery life.
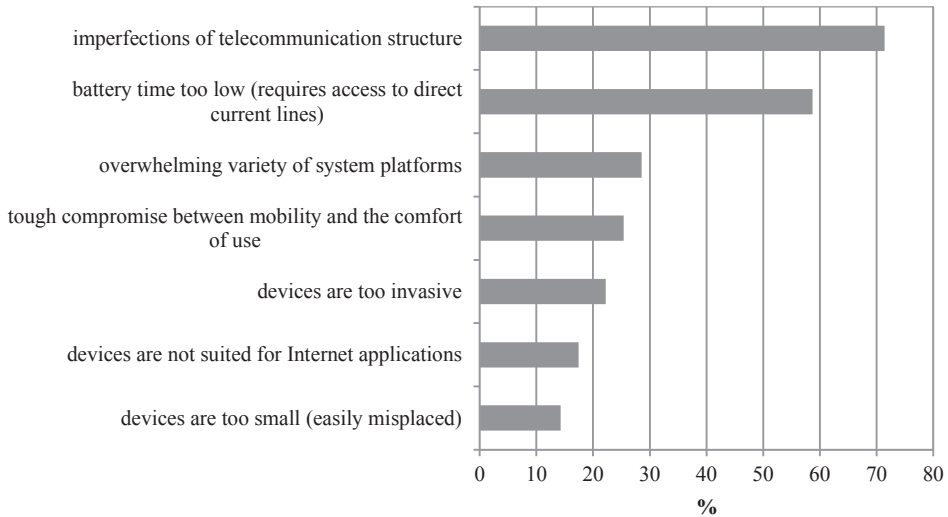
Figure 2. Flaws of mobile technologies in the context of their business application (in % of companies)

Source: own research based on study findings.

The respondents were also asked to express their opinion on obstacles in the implementation of mobile technologies (Figure 3).
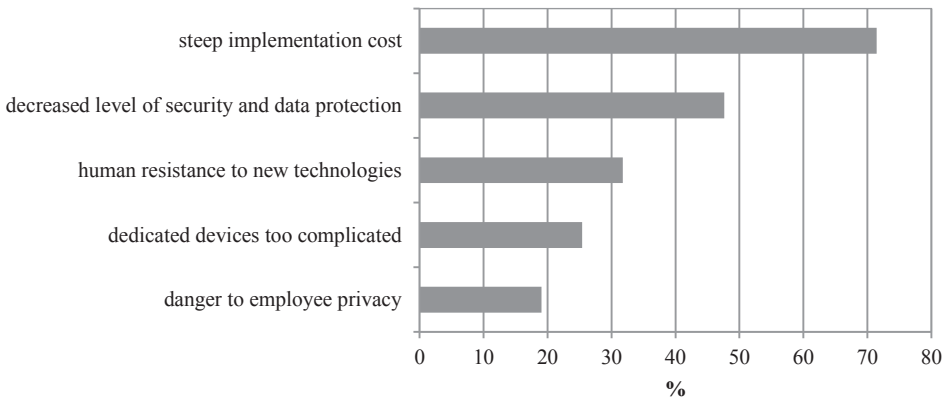

Figure 3. The most important barriers to implementation of mobile technologies (in % of companies)

Source: own research based on study findings.

The research findings show the sustained weight of economic factors as obstacles in the introduction of mobile technologies, i.e. the steep implementation cost. Another important barrier was the reduction of safety and data protection. Other

factors such as employee resistance to new technologies or limitation of employee privacy were markedly less frequent.

5. Conclusions and recommendations

Mobile technologies are steadily gaining in popularity in the business sector. The research findings presented herein show that the market majority of responding companies use mobile (cellular) phones, closely followed by (in percentage of responses) tablets, laptops and netbooks, with smartphone devices constituting less than half of the mobile devices in use. In addition, the most frequently used standards of wireless data transmission, regardless of the area of business application, were those of WiFi and GSM. Therefore an effective mobile ecosystem should focus on those technological solutions that incorporate the above structure of devices and data transmission standards. In this context, smartphone devices may be viewed as the 'ideal' solution for current business applications. This observation is in line with the findings published in the Ericsson Mobility report, quoted earlier, confirming the growing trend in this segment.

The most dominant areas of business application of mobile technologies are those of internal and external communication, with the remaining business areas gradually gaining significance. This observation corroborates the opinions voiced by respondents with respect to their expectations towards mobile technologies, namely the improvement of communication processes and the time- and space-independent access to company resources.

The research findings also show that all business areas studied still offer some margin of improvement, since the potential of mobile technologies (cf. Table 1) is not fully utilized. This, however, requires some concerted effort, with a focus not only on the introduction of new solutions, but also on the continued improvement of the existing ones. Some recommendations should be taken into consideration not only by companies that want to use mobile technologies, but also by the device producers and programmers.

Companies that consider the implementation of mobile technologies should, in the first place, take into account their main objectives and select suitable technologies for the purpose at hand, rather than use the common approach of applying new technologies for any area of application without a proper analysis of their actual economic and organizational benefits [Kutera 2013]. It is also important to take an accurate stock of current resources, i.e. human potential and the capacity of the existing IT and telecommunication infrastructures.

In particular, it is important to address the imperfections of the telecommunication infrastructure, i.e. select mobile providers who offer the required throughput and the widest possible signal coverage. In this context, it is also important to select mobile devices that offer long battery life and other conveniences that free the user from the necessity of having easy access to land-line DC source. Due to the large variety of

system and device platforms on the market of mobile technologies, companies should also take into account the need for the continuous training of their managerial staff with respect to new technologies, to make sure that their purchasing decisions are as optimal as possible. The latter recommendation is particularly important in the context of the tough compromise between increased mobility and the ease of use (device portability and size). The purchasing decision should also take into account the invasive character of mobile devices (such as the risk of being overwhelmed by unwanted or redundant messages), as well as their suitability for Internet applications.

Lastly, company decisions with regard to the introduction of mobile solutions should take into account the most important barriers to implementation, by focusing on the optimization of cost, improvement of data protection and security, and the training of employees (to eliminate or greatly reduce the human resistance factor).

Practical use of the presented recommendations should result in a better matching of technologies used for specific applications, their accurate selection for particular business purposes and could be helpful in the process of creating future mobile solutions.

6. Summary

In the light of the above deliberations, it may be concluded that mobile technologies have a great impact upon the evolution of business operation in all areas. The approach presented herein, as opposed to the usual practice of global market analysis in the context of the business application of mobile technologies, helps gauge the 'maturity' level of individual areas of the business operation of Polish companies in their striving for the implementation of mobile technologies. The identification of the evolutionary changes resulting from the implementation of mobile solutions, coupled with the analysis of current trends observed in Polish companies, helps establish meaningful recommendations for the use of mobile technologies for business purposes.

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EWOLUCJA PODSTAWOWYCH OBSZARÓW DZIAŁALNOŚCI GOSPODARCZEJ POLSKICH PRZEDSIĘBIORSTW W KONTEKŚCIE WYKORZYSTANIA TECHNOLOGII MOBILNYCH

Streszczenie: Technologie mobilne stanowią istotny czynnik zmian w podstawowych obszarach działalności przedsiębiorstw. Zmiany te obejmują komunikację wewnętrzną, zewnętrzną i organiczne funkcje przedsiębiorstwa. Celem artykułu jest identyfikacja zmian spowodowanych wpływem technologii mobilnych. Rozważania zostały przeprowadzone na podstawie badań ankietowych, na których podstawie dokonano analizy i oceny aktualnego poziomu wykorzystania technologii mobilnych we wskazanych obszarach. Rezultatem badań było sformułowanie istotnych rekomendacji odnoszących się do prawidłowego kształtowania sposobów wykorzystania technologii mobilnych w działalności gospodarczej polskich przedsiębiorstw.

Słowa kluczowe: technologie mobilne, komunikacja wewnętrzna, komunikacja zewnętrzna, organiczne funkcje przedsiębiorstwa.