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THE POSSIBILITY OF USING MOBILE PHONES IN SUPPLY CHAIN MANAGEMENT: A CASE STUDY OF THE LAST LINK IN A SUPPLY CHAIN

The paper explores the role of mobile telephony in the last link of a supply chain. The authors have focused on mobile use by customers while shopping. The survey results are also presented. The research conducted by the authors suggests that mobile phones may be an effective tool to assist consumers in their planning and shopping decisions. It is also a tool for communication between the last link in a supply chain and customers. However, it should be noted that availing of possibilities of mobile phones by Polish respondents while shopping is not at the same level as it is in the United States and Western Europe. According to the respondents, this situation is set to change in the near future. Therefore, mobile telephony as a tool should be included in supply chain business model in order to satisfy customer expectations.

Keywords: *mobile technologies; supply chain management; consumer research; mobile advertising.*
JEL classification: O31, M 30, M37.

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МОЖЛИВОСТІ ВИКОРИСТАННЯ МОБІЛЬНИХ ТЕЛЕФОНІВ В УПРАВЛІННІ ЛАНЦЮГОМ ПОСТАЧАННЯ: НА ПРИКЛАДІ ОСТАННЬОЇ ЛАНКИ В ЛАНЦЮГУ ПОСТАЧАНЬ

У статті описано роль мобільних технологій в управлінні постачаннями. Увагу сфокусовано саме на останній ланці у ланцюгу постачань – процесі шоппінгу та використання мобільного телефону під час нього. Результати проведеного опитування вказують на те, що мобільний телефон може стати ефективним інструментом планування покупок та прийняття рішень про придбання. Однак, при цьому слід відмітити, що у Польщі можливості для такого використання мобільних технологій ще не настільки великі, як у США або Західній Європі. Але ситуація поступово змінюється, як відмічають респонденти опитування, і незабаром і в Польщі мобільний телефон може стати елементом бізнес-моделі ланцюга постачань, здатним підвищити рівень задоволеності клієнтів від процесу купівлі.

Ключові слова: *мобільні технології; управління ланцюгом постачань; дослідження споживацьких преференцій; мобільна реклама.*
Рис. 3. Табл. 4. Літ. 34.

Майя Киба-Яняк, Катаржина Чеба, Анна Баранечка

ВОЗМОЖНОСТИ ИСПОЛЬЗОВАНИЯ МОБИЛЬНЫХ ТЕЛЕФОНОВ В УПРАВЛЕНИИ ЦЕПОЧКОЙ ПОСТАВОК: НА ПРИМЕРЕ ПОСЛЕДНЕГО ЗВЕНА В ЦЕПИ ПОСТАВОК

В статье описана роль мобильных технологий в управлении поставками. Внимание сконцентрировано на последнем звене в цепочке поставок – процессе шоппинга и использовании мобильного телефона в нём. Результаты проведённого опроса указывают на то, что мобильный телефон может стать эффективным инструментом планирования покупок и принятия решений о покупке. Однако, при этом стоит отметить, что в Польше возможности для такого использования мобильных технологий ещё не настолько широки, как в США или в Западной Европе. Но ситуация постепенно меняется, как отме-

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чают респонденты опроса, и скоро и в Польше мобильный телефон может стать элементом бизнес-модели цепи поставок, способным повысить меру удовлетворённости клиентов от процесса покупки.
Ключевые слова: *мобильные технологии; управление цепочкой поставок; исследование потребительских преференций; мобильная реклама.*

Introduction. Supply chain management has being changing since technologies began to develop. Mobile telephony is one of these recent technologies which have strong influence on business. Earlier, for a long time, people used mobile phones for communication only. Currently, in addition to communication, entertainment and information functions, it is also a tool for business transactions. The popularity of mobile phones around the world, as well as their newer functions, represents a challenge for many companies in the field of customer service.

Popularity of mobile phones among consumers has increased in a very dynamic way. It is no wonder that retailers have noticed a huge potential in mobile marketing, enabling the acquisition of new customers and maintaining those already acquired. Thanks to new technologies, growing numbers of telecommunications companies are beginning to explore individual consumer preferences.

The main aim of the article is to answer the question: what is the role of mobile telephony in the last link of a supply chain in the retail sector? The authors have set the following additional questions set:

1. Is mobile telephony popular among consumers in traditional retail shopping?
2. What kinds of mobile phone applications are used by customers while shopping?
3. What kinds of mobile phone applications will be used by customers while shopping in the future?

In order to answer the above questions the authors decided to conduct a survey among a group of mobile phone users in one of the medium-sized cities in Poland. The survey was carried out between August and October 2012.

Different perspectives on supply chains. Previously, logistics was focused on processes and operations occurring in the company. Currently, we are increasingly facing competition not only between individual companies but the entire supply chains.

In literature there are many definitions of a supply chain (Table 1). Some of them (Beamon, 1998; Bridgefield Group 2006; Pienaar, 2009) draw particular attention to supply chain efficiency defined as the transformation of raw materials into finished products and their delivery to end users. This group of definitions restricts its consideration to only physical flow of products. The following two definitions extend the reach of its deliberations, in addition to previously mentioned aspects, about the flow of information – so important from the logistics point of view (Little, 1999; Ayers, 2001). However, the majority of definitions presented in literature (Chow and Heaver, 1999; Mentzer et al., 2001; Fertsch, 2006; Christopher, 2000; Witkowski, 2003) made a particular focus on the interaction between all companies (in the area of flow of material, information and financial resources) in supply chain in order to deliver final product to final consumer.

According to Rutkowski (2004) the concept of supply chain should not function at all, as the driving force in supply chain is not delivery but demand created by cus-

tomers. According to Christopher a better term would be "chain demand" that from the business perspective would be more appropriate to the activities taking place in a supply chain. But regardless of how we call the processes between actors in favour of producing the product or service for the end customer, the most important thing is that these processes are coordinated and integrated into the entire supply chain. According to Ciesielski (2009) the ideal supply chain is that in which we are able to accurately plan production and delivery (in the time we expect), provide customers with a large variety of goods – according to their individual expectations, as well as minimise costs, shorten delivery time and eliminate stocks. In fact, there is no ideal supply chain. However, there is a possibility to get closer to some ideal through the use of methods and tools that allow the improvement of the flow of goods and information and to work closely with particular actors on manufacture and delivery of product (service) to final customer. These actions can improve all the processes throughout the supply chain and consequently reduce costs and improve customer service. Deshpande (2012) based on 38 reviews of the literature on supply chain management, has shown that long-term cooperation, followed by information technology, integrated design, strategic purchasing and logistics affect the success of supply chain management.

On the basis of the above considerations and based on the definition of the Council of Logistics Management, it can be assumed that supply chain management is the integration and coordination of activities related to efficient material and information flows on the basis of long-term cooperation of all companies and organisations involved directly or indirectly in production and delivery of the right product/service to final customers. A timely and efficient flow of information is of particular importance in a supply chain (Szozda and Werbinska-Wojciechowska, 2013).

The role of mobile phones in supply chain management. The current process of supply chain management is becoming more dynamic and efficient by integrating business processes to deliver the best possible service/product to final consumer while retaining cost efficiency and ensuring a certain level of customer service (Killoran et al., 2005).

Undoubtedly, the development of a supply chain is affected by increasingly extensive availability of most advanced technologies. The almost universal access to the Internet, and with it much information in real time, is one of the most significant advances of the XXIst century. Today the Internet is present in over 60% of households in Poland and through mobile phones it is available to 15% of Polish people (Smith, 2012). According to the Economist Intelligence Unit study, 31% of the representatives of retailers believe that the increasing use of mobile phones will change customer expectations by 2020. At the same time 38% of them expressed the opinion that the main channel for interaction with customers is a mobile phone. These changes will force companies implement new channels of communication throughout the supply chain (AlHinai et al., 2010), which includes such tools as mobile phones (Figure 1).

The use of mobile devices for retail stores is associated with the so-called mobile commerce (m-commerce). In literature there are many definitions of m-commerce, most of which relate to it as any business transaction executed by a wireless telecom-

munications network (Clarke, 2001; Yang, 2005) or any communication service via the Internet using mobile phone devices (Yazdanifard and Elkhabir, 2011). According to some authors (Coursaris et al., 2002; Kwon, 2004; Patil, 2012; Alqahtani, 2010; Jahanshahi et al., 2011) m-commerce has developed in a natural way from electronic commerce, in which mobile devices played an important role.

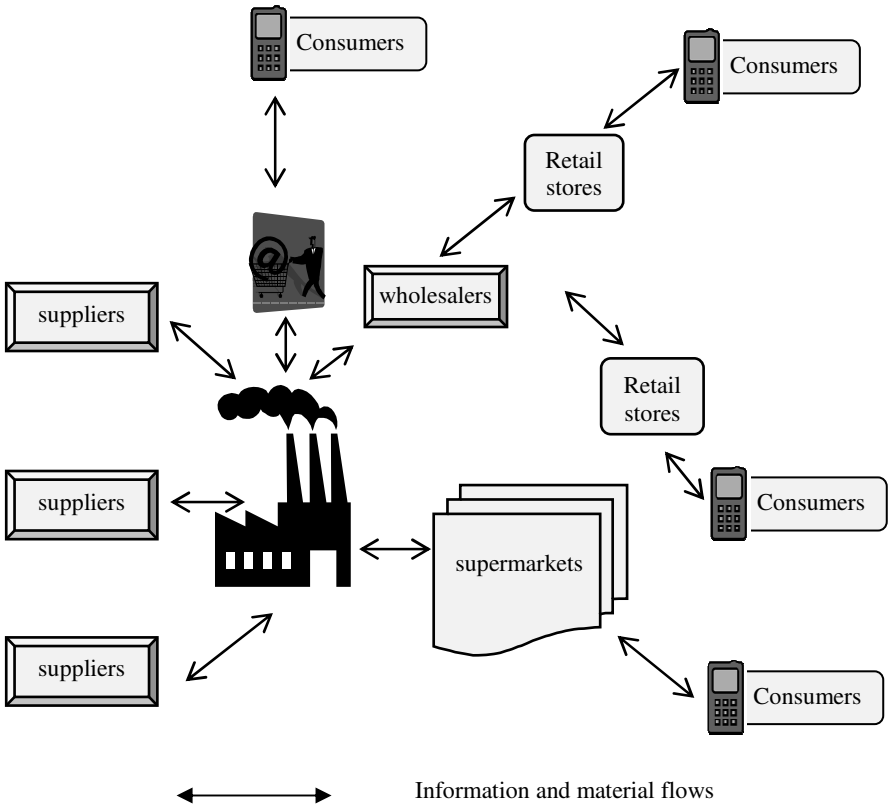

Figure 1. **Mobile phones use in the last link of the supply chain in relation between consumers and retail stores,** *own study*

There are many fields in the last link of supply chain where mobile phones can be used by customers or retail stores. Among them are: bluetooth marketing, mobile advertising, mobile search, mobile calls etc. Table 1 presents the advantages of the mobile phones use in traditional shopping process for both final customers and the entire supply chain.

According to the information in Table 1 there are many benefits of using mobile phones in a store. From the point of view of customers mobile phones allow them make more rational decisions. Before they decide to buy a product in a shop, they can check prices in other stores, read reviews on this product or call a friend. There are also many advantages for supply chains from the use of mobile phones by consumers. They can identify customers' needs, personalise their promotions by sending a message to customers, using bluetooth or even calling them.

Table 1. **The advantages of using mobile phones in the last link of supply chain,** *own study*

Shopping process	Advantages for:	
	Consumers	The last link in the supply chain
Before a shop visit	1. Possibility of searching for information on products in the Internet. 2. Possibility to check the prices. 3. Possibility to search for the cheapest shops in the Internet. 4. Possibility of searching for information on shop location, direct route etc.	1. Mobile advertising – informing customers about new offers, sales, promotions, by SMS
During a shop visit	1. Better decision-making by: a) dialling friends and family and asking them for opinions on a product; b) checking the online prices at other stores; c) searching the Internet for reviews of the product. 2. Finding information on the store's website where shopping is currently done. 3. Scanning prices using barcodes. 4. Searching for information by scanning QR codes. 5. Making micropayments through mobile phones. 6. Reading bluetooth messages sent by retailers.	1. Mobile advertising and information providing by: a) bluetooth messaging on a mobile phone about the current offers, promotions; b) QR codes. 2. Individual customer needs identification
After a shop visit	1. Handling claims. 2. Searching for information on how to install the product and its use	1. Relation with customers via mobile messages in order to inform them about promotions, discounts, sales, new products

Research methodology and the result of the survey. For the purposes of this paper the authors have focused on the use of mobile phones by customers while shopping. The authors have developed 5 steps to implement the study (Figure 2).

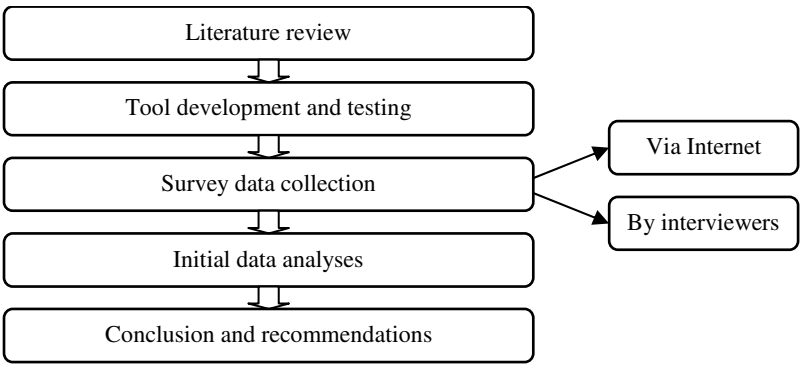

Figure 2. **Research process,** *own study*

The survey was conducted between August and October 2012 using two methods: online (using the program for creating polls: www.ankietka.pl) and face-to-face interviews (conducted in Polish by trained interviewers).

The sample, which consisted of 408 persons (Figure 3), was a stratified quota sample selected by the following criteria: gender and age (limited to the 18-to-45 age group – the group of people benefiting most from smartphones) (Mobile Future in Focus, 2012).

The questionnaire has been developed in Polish basing on (Smith, 2012; Mobile Future in Focus, 2012; CMB Consumer Pulse, 2011; Report LJS Strategic Research, 2012; On Device Research, 2012).

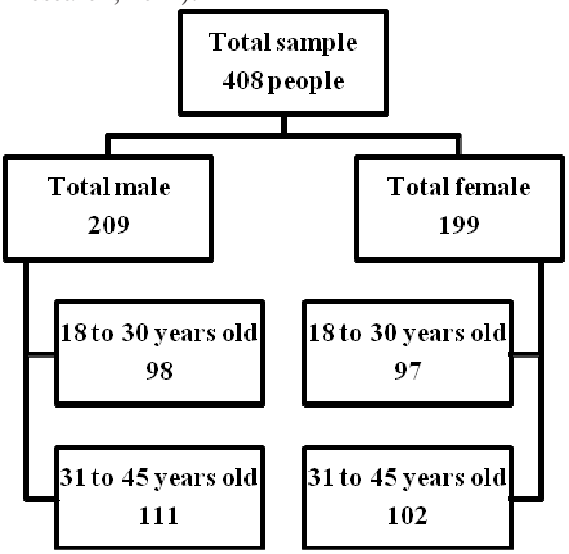

Figure 3. **The sample,** *own study*

The survey included 9 questions, most of them closed, focused on the use of mobile phones while shopping in stores. The questionnaire was divided into 5 areas (Kiba-Janiak, 2014):

- use of mobile phones in stores;
- scanning by mobile phones barcodes and photo codes in retailing store;
- payments via mobile phones;
- mobile advertising;
- future use of mobile phones in stores.

For the analysis of the data, the authors used SPSS. The obtained results allowed drawing conclusions and arranging further recommendations.

In the first group of questions, which concerned the use of mobile phones by the respondents while shopping in the store, the following results were obtained (Kiba-Janiak, 2014):

- over 60% of women and nearly 55% of man dialled from a mobile phone to a friend (close person), to ask for advice while shopping (that meant that mobile telephony helped consumers to make decisions about their purchase).
- approximately 33% of women and 24% of men did not use mobile phones at all in store.

Moreover, the research shows (Table 2) that male respondents were more likely than women to use mobile phones in the shop in order to (Kiba-Janiak, 2014):

- compare the price of the product on the Internet (22% of men, 13% of women);

- search the Internet for reviews (14% of men, 10% of women);
- go on the store's competitors' websites (4% of men, 2% of women).

These results indicated that Internet access in mobile phones may enable customers obtain information in real time.

Table 2. **Number of the respondents using mobile phones while shopping (multiple answers possible),** *own study*

Answers	Gender			Age		
	Men	% of male sample	Women	% of female sample	< 30	31–45
Yes, I call a friend or a person close to me for advice on ongoing purchase	114	55%	125	63%	120	119
Yes, I compare the price of the product, which I want to buy on the Internet	47	22%	26	13%	33	40
Yes, I search the Internet for reviews of the product	30	14%	19	10%	27	22
Yes, I go to the store website in which currently I am doing shopping	8	4%	3	2%	5	6
Yes, I go on competitive websites for the retail store, in which I am currently doing shopping	17	8%	6	3%	9	14
I do not use a mobile phone while shopping in the store	50	24%	65	33%	53	62
Yes, for a different purpose	17	8%	22	11%	26	13

The following groups of questions were related to advanced solutions in mobile phone, which can be used while shopping for obtaining information about a product:

- barcode scanning;
- QR code scanning;
- sending messages to consumers' mobile phones;
- receiving bluetooth messages from retailers while shopping.

The conducted research showed that advanced solutions in mobile phone, which can be used while shopping, was popular. Over 90% of female respondents and about 70% of men respondents said they did not scan the barcode or QR code by a mobile phone in the shop (Table 3). However, men were more keen on scanning barcodes and QR codes than women.

Table 3. **Number of the respondents who never scan barcodes or QR codes by mobile phone while shopping,** *own study*

Answer "never"	Gender		Age	
	Men	Women	< 30	31–45
Scan barcodes	163	185	170	178
Scan QR codes	151	195	170	176

The next group of questions was focused on mobile advertising. It is the new direction of marketing activities for many retailers. New technological capabilities of mobile phones not only allow sending messages, but also use the bluetooth system to transmit information about new store offers, new products, promotional campaigns, sales etc.

For questions on encouraging consumers to shop by sending mobile messages and receiving bluetooth messages from retailers, the vast majority of the respondents answered that they did not use the function of transferring information while shopping or the messages did not matter to them.

A large proportion of respondents (107 male respondents and 91 female respondents) believed that these kinds of marketing activities (mobile messages) did not encourage them make purchases in the store. A mere 2% of female respondents and just over 4% of male respondents consistently paid attention to such messages and took into account the information sent by bluetooth. An interesting fact is that more female respondents (almost 90%) than male respondents (over 60%) did not use such a tool while shopping. Those figures show that men were more likely to use new technological solutions in their mobile phones than women.

Despite the fact that mobile phones in Polish retail stores are as yet relatively unpopular and consumers need a little more time to switch to the new technology, the results of the survey indicated that, in the future, a large proportion of the respondents would be interested in the use of mobile phones while shopping (Table 4). The survey revealed that:

- in the future more female respondents (almost 50%) than men (40%) would be interested in scanning barcodes to obtain information about product price while shopping,
- almost 30% of the respondents (both female and male) would like to scan photo codes to get more information about a particular product/service and pay for goods in a shop with a phone.

At the same time almost 40% of female respondents and 22.9% of male respondents stated they would not be interested in using their mobile phones while shopping. However, the above research showed that this situation may change in coming years.

Table 4. **Respondents' opinions on the possibility of using mobile phones while shopping in the future,** *own study*

Answer	Gender		Age	
	Men	Women	< 30	31–45
Scanning bar codes to obtain information on product price	84	94	96	82
Paying for goods in a shop	63	51	53	61
Receiving messages via bluetooth	12	14	15	11
Photo code scanning to obtain more information on goods/ services	62	56	59	59
These functions and applications that I use on a mobile phone while shopping are enough for me	25	19	17	27
Using a mobile phone while shopping doesn't interest me	48	78	58	68

Conclusion. The use of mobile phones is becoming essential in many fields. More and greater possibilities of smartphones make mobile phone use no longer simply an instrument for verbal communication between people, but is becoming a tool for work and entertainment (games, social networking, Internet).

In the paper the authors have presented the results of surveys conducted among retail store customers in order to elicit their opinions about the use of mobile phones while shopping. The research conducted by the authors showed that the use modern

applications in mobile phones by Polish respondents while shopping has yet to reach the levels of popularity found in corresponding studies carried out on North American citizens in the US (Report LJS Strategic Research, 2012). However, the research shows that mobile phones help consumers make decisions about purchases.

The results clearly indicated that managers of supply chains in Poland remain considerably less capable than their American counterparts, in the use of data collection and communication with clients in order to improve flows in the supply chain. The reason for low popularity of the mobile technology use at the consumer level seems to be not only a stage in the development of Polish economy and the associated consumption patterns, but also limited interest in collecting data in this way by links of a supply chain. However, insignificant interest is mainly related to unconscious links to the value of actual demand data for the success of the individual, as well as the success of the entire supply chain. This indicates a relatively modest level of maturity of supply chains in Poland, as already confirmed by the research conducted in 2012. On the basis of the selected criteria for assessing the degree of maturity of supply chains proposed in the Model Poirier, it was found that the majority of companies surveyed were at the initial phase of development. The largest barrier to improving supply chains in Poland has been the lack of proper communication and limited confidence in the subcontractors. As an indirect result of the research is also still relatively low level of competence of Polish enterprises in supply chain management (Baraniecka, 2013).

The described situation is not favourable for Polish entities. The role of information, particularly that derived directly from consumers, has become crucial for smooth, synchronised management of supply and demand in supply chains. Without data straight from the market it is difficult to take initiatives to improve the supply chain, such as management classes or integrated planning, not to mention the more complex concepts, such as: efficient consumer response or collaborative planning, forecasting and replenishment. One should hope that attaining higher levels of excellence in the management of supply chains in Poland will become a prerequisite to intensify the use of new technologies to communicate with consumers and the extraction, processing and sharing of data about real attitudes, preferences and demand in general. At that point the data collected from consumers through mobile phones will not only improve the effectiveness of retailers' marketing activities, but also enhance the knowledge on real demand in all links of supply chains.

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