

# PURCHASING AS A LEVER OF INNOVATIONS IN ERA OF DIGITAL TRANSFORMATION

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## ABSTRACT

Digitalization offers breakthrough possibilities within supply chain management and there is a growing need for implementation of digital technologies in various business processes. The use of digital technologies in purchasing is in the early stages of its development. However, purchasing is evolving towards a strategic leadership function in delivering value in supply chains. The importance of purchasing function is especially emphasized in development of innovations both in internal (with other business functions) and external cooperation with suppliers. Main purpose of the paper is to explore the role of purchasing function as a lever of innovation development and to define significance of emerging digital technologies within this process. To research the phenomenon empirically, two surveys and three in-depth case studies were conducted in 2016-2019. It has been confirmed that suppliers are the most important partners in producers' supply chains in development of innovations, regardless of their type. This trend emphasizes the importance of purchasing within supply chain management. In addition, purchasing function is increasingly involved in cross-functional innovation development projects in companies and is beginning to play a leading role in them. Best practices of chosen companies indicate that emerging digital technologies become more and more important catalyst of internal and external collaboration on innovation development, with proactive participation of purchasing function. Furthermore, digital technologies transform the role of purchasing in innovation development process. This function not only buys innovations as before, but significantly increases focal company innovativeness by collaborating with internal customers and external suppliers. Moreover, digital technologies drive both internal customers and suppliers to take the initiative and offer innovative ideas. Research results enrich the purchasing literature and business practice, emphasizing huge potential for using purchasing function as a lever of innovations in era of digital transformation.

**Keywords:** supply chain management, purchasing, buyer-supplier relationship, innovation development, digitalization, best practices.

## 1. INTRODUCTION

Increasing competition, complexity and uncertainty in the 21<sup>st</sup> century environment have presented an opportunity for purchasing to evolve its value proposition to the business. Purchasing is defined as management of the company's external resources in such a way that the supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company's primary and support activities is secured under the most favourable conditions (Van Weele, 2018). In the traditional approach, purchasing function is responsible for ensuring deliveries of goods and services to the company's operations and its key goal is costs reduction. In turn, the modern approach emphasizes more and more often that this function will

shift its priorities to increase companies' value by innovation development. Purchasing can be regarded as a boundary spanning function that should be integrated with other business functions (Foerstl *et al.*, 2013; Kaufmann & Gaeckler, 2015). According to estimates, between 40% and 60% of opportunities to create innovation in supply chains come from suppliers (Ferreiro *et al.*, 2014). Referring to C. Mena (2014), the largest value of the purchasing function for building companies' competitive advantage comes from external sources identified in the supply base. Supplier innovation management is extending the innovation capabilities of the purchasing function and the entire company, driving continuous exchange of knowledge and innovation development in supply chains. Suppliers were recognised as having a large innovation potential (Wagner, 2012). Exploiting the potential of co-creating and implementing innovations in cooperation with suppliers allows companies to significantly increase the value provided to customers and other stakeholders of supply chains (Kibbeling *et al.*, 2013).

There is a chance in the digital era that purchasing will increase its corporate value as an innovation leader and catalyst by linking essential external knowledge and competencies with internal business partners to ensure technology and market leadership of the own company (Schreiber *et al.*, 2016). According to Schreiber *et al.* (2016), successful digital transformation of purchasing delivers substantial increase in company's value ranging from 5% to 10% of EBIT through an increased innovation level. The role and effects of digitalization in purchasing management are described in several reports of consulting companies as "a catalyst for change", "source of revolutionary changes", "a new era", "a radical transformation", "a turning point", "a breakthrough change" or "a powerful force". Much less often, this impact is the subject of attention and analysis in academic publications and empirical research, in particular related to purchasing and supply management. There is a research gap with regards to digital technology applications, the scale and effects of digital transformation of this management area. According to Mogre *et al.* (2017), research contributions in the area of purchasing development in the digital economy are extremely limited.

This article explores the role of purchasing function as a lever of innovation development and the importance of emerging digital technologies in creating cooperation of this function with internal customers and suppliers aimed at developing innovation. It is structured as follows. First, the existing literature on evolution of purchasing role in business is reviewed, concentrating on the need for companies to develop proactive, market oriented purchasing function in interdependent innovations ecosystems. Next, the author provides a short overview of methodological approach. This is followed by a description of empirical findings, wherein the most attention is devoted to the original case studies presenting best practices on how digital technologies have become a catalyst for internal and external cooperation on innovation development, with active participation of purchasing function. Finally, the author discusses findings within the theoretical context of purchasing evolution and give managerial implications.

## **2. THEORETICAL LENSES**

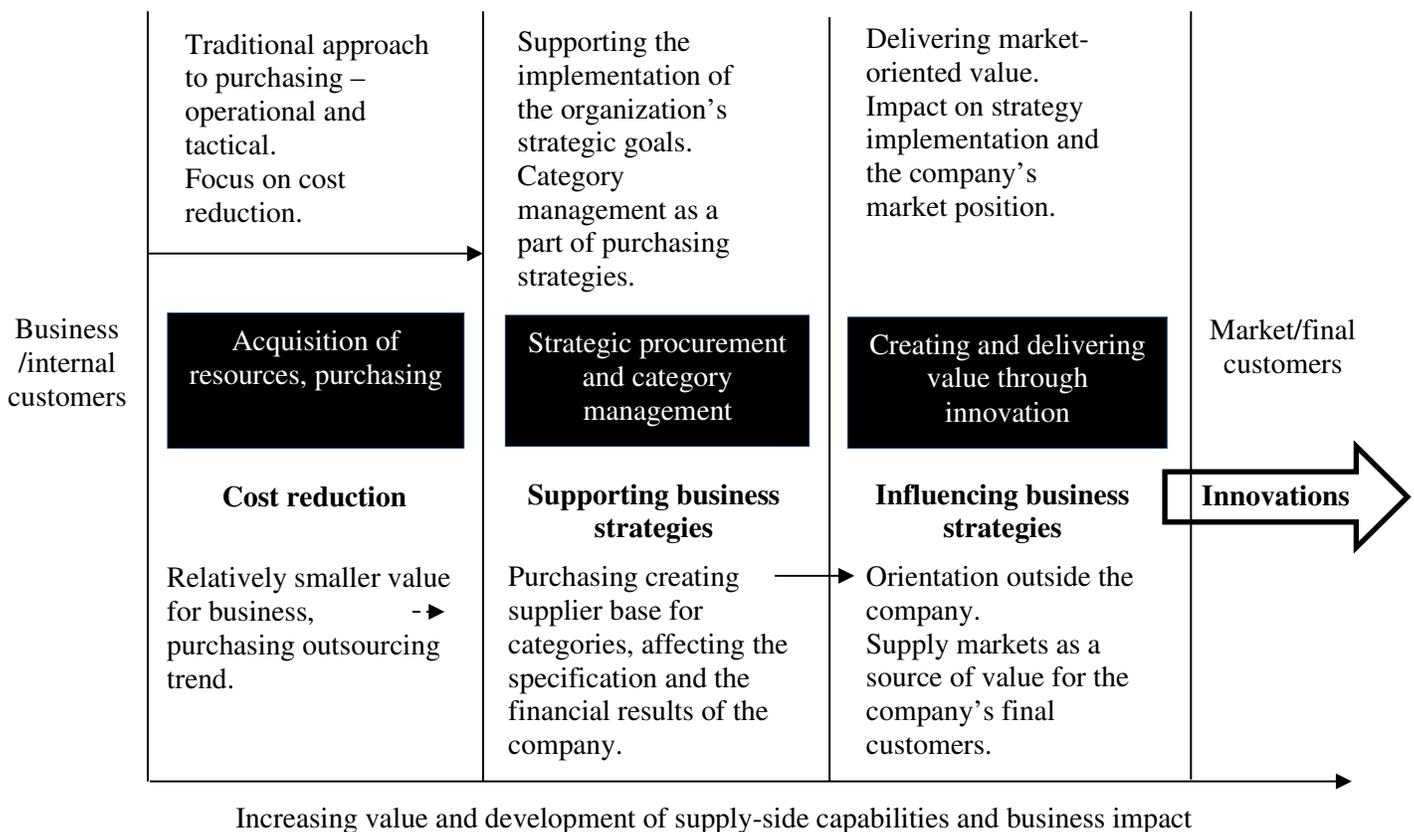
The literature review presents a contextualization of the two basic components of this study: purchasing evolution and purchasing digitalization.

### **2.1 Evolution of purchasing role in business**

The evolution of the place and role of purchasing function in companies and supply chains is represented in the literature by maturity models. They constitute a general approach to the elements of maturity of the purchasing function together with their development oriented at the gradual increase of its role in achieving goals and building competitive advantage of companies.

Based on the results of the literature review, it should be pointed out that purchasing is evolving from a passive to an integrating function (Reck & Long, 1988), from reactive to world-class process (Burt & Doyle, 1993), from product-centred to performance-centred function (Stannack & Jones, 1996), from early role recognition to advanced involvement (Jones, 1999), from reactive to proactive and leading in identifying and meeting the needs of internal and external customers (Cavinato, 1999), from low to strategic development (Cousins *et al.*, 2006), from reactive role to integration in the supply chain (Monczka *et al.*, 2010), from transactional to a leading business function (Mena, 2014), from providing supply to value management (Chick & Handfield, 2015), from transactional orientation to value chain integration (Van Weele, 2018). In the light of the conclusions from the analysis of purchasing maturity models, key elements in the evolution of this function have been identified, such as: strategic approach, position in the organisational structure, internal integration in the company, external integration in the supply chain, performance measurement, the use of technology and employee competences in purchasing departments (Ocicka, 2019).

At the highest levels of maturity, purchasing becomes a function of strategic importance, integrated internally and externally as well as increasingly market-oriented. Figure 1 presents how purchasing is taking more and more the view from business to market.



**Figure 1.** Purchasing’s value proposition

Source: Chick & Handfield, 2015, pp. 206-212.

Purchasing is evolving from a function directed mainly at the supply side of the market to a function focused on market needs on the demand side, identified among the company’s final

customers. Increasingly, it provides value within innovation management, among others through: implementation of innovation in the purchasing department and process, identification of sources of rare (innovative) resources, purchase more innovations in less time, cooperation in cross-functional projects (or their management) in order to develop different types of innovations, acceleration of the design and development cycle as well as commercialization of product innovations, identification of suppliers with innovative potential, early supplier involvement, co-creation of innovations with suppliers and supplier development. As the role of purchasing function increases in strategic and innovation management, there will be an increasingly important need to manage relationships with internal customers and external suppliers. In this context, digital technologies might help companies to collaborate in interdependent and dynamic innovation ecosystems creating a web of tech-enabled services that connect parties inside and outside of the organization and digitalizing their cooperation.

## 2.2 Digital transformation of purchasing

Main emerging technologies affecting supply chain management in the 21<sup>st</sup> century include: Big Data Analytics, Internet of Things, robotics and automation, cloud computing, mobile technologies and electronic wearables, autonomous vehicles and drones, 3D printing and other advanced manufacturing technologies, virtual and augmented reality, cognitive technologies and artificial intelligence, social media, technologies supporting digital security and enabling human-machine and machine-machine interaction, intelligent agents, blockchain and other technologies related to Industry 4.0 (Nowosel *et al*, 2015; Schreiber *et al*, 2016; Von der Gracht *et al*, 2016). There are fundamental principles for a comprehensive digitalization intervention in purchasing and supply management, namely: to use multiple digital technologies and evolve from internal development to focus more on external value contribution (Singh Srai & Lorentz, 2018). It was found, that digital transformation involves changes in strategies, processes and organizational structures within this business area (Kleeman & Glas, 2017). Digitalization in purchasing management is exerting influence on various aspects – from the collection and transmission of data using information and communication systems, to the automation of processes and the development of digital purchasing platforms determining the transformation of management models. On the one hand, digital technologies are on pace to automate most routine purchasing processes within 3 to 5 years, on the other hand, digitalization unleashes new value sources and gives purchasing a bigger strategic role (Easton & Epstein, 2018).

Based on the model of the evolution of IT systems supporting purchasing and supply management, the following milestones might be indicated: MRP, ERP, e-procurement and Procurement 4.0 (Glas & Kleemann, 2016). In the discussions of purchasing and supply chain managers in recent years there are statements about the development of Purchasing 4.0 Procurement 4.0, Einkauf 4.0, presenting the digital transformation of purchasing management in the light of the concept of Industry 4.0. Digital technologies creates a new ecosystem accelerating the development of purchasing management, that evolves to digital procurement, wherein procurement moves to the centre of value creation by connecting the business with a network of external partners to create new business models (Yap *et al*, 2018). Furthermore, it is possible to achieve technological synergy effects with suppliers. Kleeman & Glas (2017) proposed segmentation of suppliers into four groups, depending on the potential and the ability to develop and apply digital technologies, such as: digital supply champions, digital traditionalists, digital potentials and digital laggards (pp. 24-25).

Crucial changes in purchasing management influenced by modern digital technologies have been predefined as a result of research carried out by Fraunhofer-Institut fuer Materialfluss

und Logistik IML and Bundesverband Materialwirtschaft, Einkauf und Logistik e.V. It was pointed out that the operational aspects of purchasing management will be automated, while increasing the concentration of purchasing function on strategic aspects for which requirements and challenges will increase (Pellengahr *et al*, 2016). Additionally, Bienhaus & Haddud (2018) from the University of Liverpool conducted an international survey among 414 purchasing and logistics managers focused on the digital transformation of the purchasing area in companies. It aimed to assess the impact of digitalization on purchasing and supply chain management, in particular at the strategic level. The results of the research have shown that artificial intelligence, Big Data and Internet of Things are key elements that can be used in the operational management, leaving more potential for activities of strategic importance realized by people. The assessment of barriers to the digital transformation of the purchasing area proves that organizations are currently not prepared for significant changes, and have so far recognized to a limited extent both the potential and the risk associated with progressing digitalization. The application of digital technologies in purchasing is still relatively a new field that misses empirical insights.

### **3. METHODOLOGY**

#### **3.1 First stage of research: 1<sup>st</sup> survey**

The survey used the Computer Assisted Telephone Interview (CATI) method and was carried out among 202 large manufacturing companies (employing 250 and more employees) from October to December 2016. Respondents were senior managers who own key competences within supply chain management and knowledge about implemented projects in cooperation with business partners. The questionnaire included research questions considering supply chain links, with which the surveyed companies cooperate to develop innovations. A division for product, process, marketing and organizational innovations was adopted (OECD & Eurostat, 2008). Due to the growing importance of technologies in era of digital transformation, technological innovations were also specified.

#### **3.2 Second stage of research: 2<sup>nd</sup> survey**

The study used a survey method in the form of CATI technique. It was conducted in October 2017 on a sample of 36 large manufacturing companies (employing 250 and more employees). The selection of respondents in the study was purposeful according to the scope of competence. Respondents were managers in decision-making positions, responsible for setting the goals of purchasing management in the company, managing relationships with suppliers in supply chains and developing practices within this area, including evaluation of the effects of cooperation aimed at developing innovation. The thematic groups of questions focused sequentially on: assessing the potential of companies in the field of innovation creation and implementation, purchase management goals and selection criteria for suppliers, types of innovations co-created, involvement of individual business functions (departments) in the development of cooperation with suppliers, incentives for suppliers for cooperation oriented on the development of innovation, effects of co-creating innovation and success factors of such cooperation.

#### **3.3 Third stage of research: case studies**

Taking into account the exploratory nature of this paper and the need to obtain an in-depth knowledge of the exploitation and influence of digital technologies on innovation development, the author adopted the case study methodology. The selection of a qualitative research method is justified by the fact that a case study is an empirical enquiry that investigates a contemporary phenomenon within its real life context and is particularly appropriate in new, emerging fields of

research (Yin, 2003). The empirical research process was based on the model for conducting case study research, presented by Seuring (2005) and comprising five stages: formulation of research questions, instrument development, data gathering, data analysis and dissemination. The following main research questions were in the center of the author's attention:

- What is the role of purchasing function in the company's supply chain management?
- How is purchasing function involved in the development of innovation?
- What is the scope of cooperation of the purchasing function with other internal business functions and external suppliers in the development of innovations?
- What is the role of digital technologies in the collaborative innovation development?
- What effects does the company achieve by supporting developing cooperation through emerging technologies?

The interview scenario was a research instrument used during the semi-structured in-depth interviews carried out with purchasing managers representing three manufacturing companies (Table 1).

**Table 1.** Data collection for case studies

Company	Industry	Respondent position	Data collection period
A	FMCG	Category manager	September 2019
B	Construction	Purchasing director	October-November 2018
C	Food	Purchasing director	June-September 2019

Source: author's own elaboration.

## 4. RESEARCH RESULTS

### 4.1 Main survey results

*Survey 1:* The surveyed manufacturing companies cooperate with various supply chain links, but scope and scale of relationships are varied. Direct (first-tier) suppliers are the most important partners in development and implementation of innovations (155 indications), regardless of their type. Cooperation with suppliers at second- and further n-tiers is developed much less frequently (64 indications). It must therefore be concluded that the closer the position of suppliers is towards the focal company initiating the innovation process in supply chain, the more often cooperation is developed. The companies most often cooperate with suppliers in order to develop product (128), process (89) and technological (80) innovations. They are much less often involved in co-creating process in case of marketing (26) and organizational (9) innovations. Interestingly, direct suppliers are the supply chain links, with which manufacturers carry out the most innovation development projects, regardless of their strategic goal of supply chain management. The role of cooperation with first-tier suppliers has been particularly emphasized in relation to the implementation of the strategic goal oriented to achieve the highest efficiency and lowest costs (56 indications).

*Survey 2:* The majority of surveyed companies (73%) do not have internal procedures defining how to develop cooperation with suppliers aimed at co-creating innovation. Similarly, most companies do not include the terms of cooperation in the development of innovation in contracts signed with suppliers. The results of the study indicate that the basis for innovation co-creation within supply chain management are other factors than formal procedures and contracts, what allows to emphasize the importance of managing relational capital with suppliers. In terms of the involvement of business functions in co-creating innovations with suppliers, production and

finance are key ones, which in the light of respondents' opinions obtained average marks of 4.12 and 4.00 respectively (on a 5-point Likert scale). The highest assessment of the involvement of production department (4.12) highlights that the development of innovation in cooperation with suppliers primarily supports core activities of the surveyed companies.

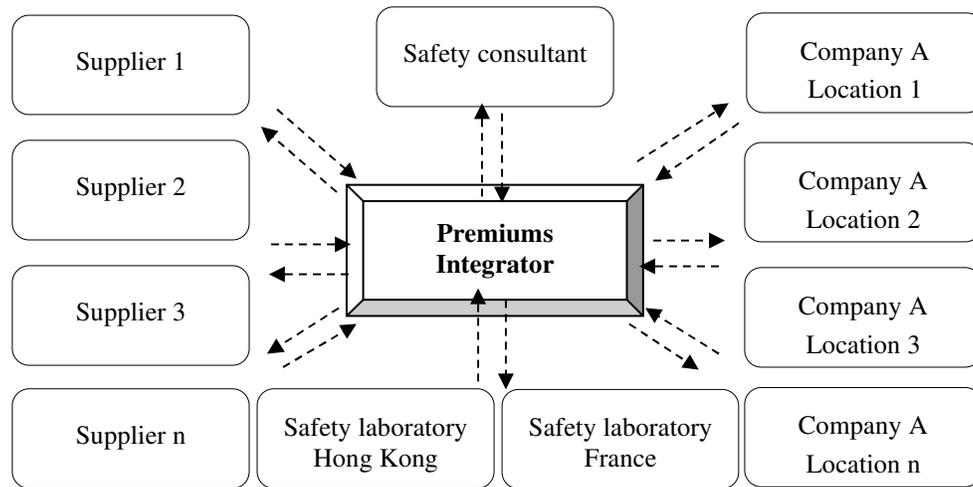
#### **4.2 Case study of the digital platform to foster collaboration, innovation and performance management**

The company A decided to implement an innovative, digital platform following its regional strategy to have one supplier who will be responsible for ordering all premiums for marketing, trade marketing and human resources activities across countries in Central and Eastern Europe (CE). This provider gained the CE Premiums Integrator (PI) status covering Poland, Baltics (Lithuania, Latvia, Estonia), Czech Republic, Slovakia, Hungary, Romania, Bulgaria and Eastern Adriatic Markets (Serbia, Bosnia, Slovenia). The chosen PI has over 30 years of expertise in premiums industry with a deep understanding and knowledge of supply chain and develops direct sourcing with one of the largest sourcing teams in the FMCG industry including more than 1,500 factories and suppliers on a global scale. The supplier follows the strictest protocols to protect the biggest brands of its clients, including compliance with health and safety rules, minimization of production risk, testing and inspection protocols, factory audits and evaluation as well as detailed and certified processes. It is part of Sedex, that is one of the world's largest organisations which aims to manage sustainable supply chains.

This unique online platform, called Web Tool, is the result of cooperation between the purchasing department of the company A, that knows the needs of internal customers, and the selected PI. Both business partners agreed on its architecture and functionality. The Web Tool is a tailor-made technological innovation that allowed the next step to implement process and organizational innovations, and finally, led to the development of a new business model of collaboration between the company A, the PI and suppliers within the supply chain (Figure 1). It mirrors the needs of most marketing and purchasing stakeholders as a comprehensive solution for many countries. The main goal behind the platform is to let the end users purchase premiums or ask for quotation for new products basing on briefs prepared by requesting departments. The platform was designed to enable intuitive navigation by its users, mostly by "clicking" windows or icons and attaching documents, which encourages them to use as well as develop it further. The solution is based on Web/JAVA technology and included connection to company's A ERP system to enable smooth ordering process (using SAP EDI).

Internal customers communicate directly with the PI through the Web Tool without involving purchasing department, which has an access to everything and receives an automatic messages about all projects. They send their requests to the PI and accept the individual stages of the process as detailed in the process in place, e.g. price, final design of the premium, etc. This made it easier for purchasing department to convince them to the involvement. The end users are also able to prepare and send requisitions which, after routing to ERP system, are automatically transferred as official purchase orders sent to the PI, maintaining reference numbers. Thanks to this solution, the number of interactions between internal customers and purchasing department was reduced significantly, which resulted in faster fulfillment of their needs. If an internal customer talks to the PI, it is the PI's responsibility to make a summary and include it in the Web Tool, hence purchasing department has a complete picture of the situation. The workload associated with the purchase of a new premium was transferred from internal customers and purchasing department to the PI responsible for providing requiring premiums on time, at the best price on the market, with high quality, meeting safety requirements. The PI selects suppliers

through RFI and/or RFQ as well as manages the supplier base, cooperating with preferred and identifying potential new suppliers across the world. It is the PI's responsibility to prepare all documents for safety tests and to supervise the entire process. The platform contains a description of purchasing, production and delivery processes, use case videos, premiums visualizations, information on safety tests, requirements and necessary documents, depending on whether the project involves creating the premium from the beginning, including designing and building an injection mould, modifying an existing premium or branding an existing product. Thanks to this, users know how much time they need to plan their activities in advance to receive the premium in the required time. The Web Tool has a calendar for each project – this means that the user knows at which stage the project is – whether in the product testing phase or in the production phase and when delivery is planned.



**Figure 2.** Business model of Premiums Integrator

Source: Materials of the Premiums Integrator.

Thanks to the platform, it is possible to consolidate orders from individual countries, which leads to savings for the company as a result of synergy: buying more premiums at a lower price, spreading the costs of safety tests over several countries and covering these costs only once. Earlier, premiums were designed in cooperation with various suppliers and information sharing between countries was very limited or not at all. The Web Tool works for several European countries – a given country has a preview of what is being carried out in another country and can join or renew the production of a given premium. Safety tests are valid for specified period, so a given country, that renews the production of a premium previously manufactured and tested for another country, does not need or undergoes safety tests to a very limited extent, which significantly reduces delivery time and brings savings. Furthermore, in the past the company A experienced difficulties with the quality of ordered or required premiums. Some premiums did not pass safety tests or it was required to redesign them and conduct safety test again, the colours of the premiums as well as the appearance of the product or brand logo did not meet the guidelines described in brand book. And if something was not in line with the guidelines, it could not be manufactured and placed on the market. The Web Tool has an archive of all completed and cancelled projects by the PI, including those that were provided for the company A before the supplier became the PI. Thanks to such approach each end user could see what, when and for

which country was produced with the price and deadline, that makes it possible to renew production.

Furthermore, the PI has a separate design department and here, based on the received briefs from internal customers, but also based on market trends, including social media analysis, or own ideas – new premiums are created/designed. Concepts from suppliers that the PI has worked with are also collected. The PI repeatedly sends new proposals via the platform, anticipating the needs of internal customers. It uses the “What’s new” section to this purpose. Additionally, it organizes inspiration workshops and sample roadshows. All acquired ideas inspire internal customers to conduct new marketing campaign for a given product. The Web Tool also has a catalogue of finished products ready for purchasing, e.g. cups, pens, paper and linen bags, etc., that can be marked with a given product brand depending on the needs. These finished goods are previously tested for safety in accordance with the company’s A policy, hence the lead time is much shorter. The platform works as a catalyst for collaboration between the company A and the PI. A dedicated, individual approach to projects of business units in CE has positive impact on supplier development, that is involved, creates ideas and connects stakeholders.

The platform has replaced email communication between users and the PI. The Web Tool has been connected to the inboxes of individual users so that they do not have to check the status of their projects every time. When new information appears, they automatically receive an e-mail to their inbox with the appropriate information. Additionally, users could decide if they want to receive messages about other brands and countries. The Web Tool also introduced chat between the Integrator and individual departments in all countries, such as design department, technical support department, internal control department and logistics department. Depending on the needs or problems with the Web Tool, the user can contact the appropriate person on the Integrator’s side. The purchasing department has access to all sections and information on: the Integrator, ongoing and completed projects for company brands as well as communication between all users and the Integrator.

The platform analyses savings calculated by the Integrator based on the Excel file provided by the purchasing department and based on access to the so-called purchase windows that operate in such a way that, e.g. a given country reports a demand for a given premium for a given brand of the company and such information is sent to users in other countries assigned to that particular brand. They can join the purchase and by increasing quantity of premiums ordered by individual countries, automatic premium price calculation takes place. Purchasing function has a preview of which countries and requested quantity they demand and how the price changes. Based on the PI data, Table 2 presents the results of the collaboration project on the platform achieved in the period 2016-2018.

**Table 2.** Results of the collaboration project on the platform

<b>Year</b>	<b>Turnover (millions of USD)</b>	<b>No. of purchase orders</b>	<b>Total savings (%)</b>
2016	7.5	378	26.4
2017	22.1	1042	16.08
2018	30.8	1248	15.86

Source: Materials of the Premiums Integrator.

#### 4.3 Case study of early supplier involvement via the Internet of Things

The multi-branch company B, operating in the construction industry, has central design department strongly integrated with purchasing department. It develops the concept of early supplier involvement within supply chain management. Its strategic suppliers are involved in all company's projects from their designing stage and supplier management process includes innovation co-creation. Close and long-term collaboration provides the following effects:

- expert assistance of suppliers at every stage of each project,
- access to the latest technologies,
- sharing information on innovations by suppliers before commercializing them,
- shortening the design cycle,
- implementation of pre-delivery and delivery procedures,
- securing production and storage capacities in suppliers' facilities,
- exchange of ideas for continuous improvement and increasing cost efficiency,
- joint research on new materials and products.

Business partners use Internet of Things to develop the Building Information Modelling (BIM). Investment area is monitored by mobile devices. Drones scan the construction investment site and transmit data. Moreover, all used cranes and devices, such as screwdrivers or drills, are equipped with sensors and Wi-Fi function that ensures full control of work. The materials are equipped with RFID tags, which allow ongoing monitoring of use and continuous replenishment at the investment site. The usage of wireless data readers allows to show the status of the production and communication in real time. BIM is created based on information, photos and videos. BIM is a digital record of the physical and functional properties of a building object, serving as a source of knowledge and all data, fully available to participants of the investment process and providing a reliable basis for making decisions throughout the entire life cycle. It allows all stakeholders of the investment process to have access to the same information at the same time through technology platforms. According to Aminoff & Kiviniemi (2016), BIM innovation is an enabler for more comprehensive digitalization of the construction process. Project management in the Internet of Things ecosystem has allowed to achieve savings, reduce production and delivery times, maintain technical control over tools/devices and increase process transparency as a result of real-time activity and resource management.

#### 4.4 Case study of the use of 3D printing in R&D as a revolution for purchasing

Company C operates in a highly competitive market for food products that are packed in glass jars. A characteristic feature of the industry is that glass moulds used in the production of jars are renewed depending on the production volume, app. every 2 to 3 years. The purchasing process for a new glass mould begins with identifying this need by the purchasing department, which reports it to the marketing department. The company's marketing department decides in any case whether to renew the existing form or modify it or develop a new packaging. It often reports new suggestions or inspirations for research and development (R&D) of new packaging. The purchasing department prepares a specification according to needs of the marketing department. The company C outsources designing of new packaging to external service providers (design agencies) or directly to suppliers (glassworks). The purchasing department selects and cooperates with contractors. Integration of research and development process between glassworks and the company C is a common practice. Glassworks as direct producers of glass packaging, have R&D departments and use 3D printing technology. This collaboration allows to design and produce new

packaging using the best competences of both parties. However, this effect is much weaker in case of contracting out R&D to design agencies, that have no competence in packaging production.

The company C acquires digital designs and sample copies of new packaging from suppliers, which in the next step are subject to quality control and marketing tests. Currently, the company's purchasing department uses 3D printing technology for R&D of new packaging in cooperation with suppliers. Previously, the company used expensive models made of plexiglass. The project team responsible for the development of a new packaging form can order and test many packaging patterns created by 3D printing technology in a short time. The technology offers immediate opportunity to make changes to digital designs (e.g. colour, shape and/or engraving). Suppliers can provide a new packaging standard within few hours, including visualizations and several copies of new printed packaging for testing. The marketing department decides about choosing a specific project.

The use of 3D printing in R&D allows to achieve the following effects:

- shortening the time needed to design and prepare a pattern for a new packaging (in one day),
- reducing the costs of making patterns (30 USD in 3D printing compared to 700-800 USD in the case of plexiglass),
- individualization and the possibility of making several packaging patterns,
- higher degree of similarity of the packaging printed to made of glass than in the case of using plexiglass,
- resource saving as a result of additive instead of subtractive manufacturing.

The purchasing director emphasized that the use of digital projects and additive manufacturing (3D printing technology) has revolutionized the sphere of research and development as well as purchasing of packaging in the food industry.

## 5. DISCUSSION

Purchasing function at the highest levels of its maturity gains an increasing impact on building companies' competitive advantage through innovation. Purchasing department employees participate in cross-functional and cross-organizational projects aimed at sharing knowledge and developing innovation. Proactive involvement confirms their role in both the closed and open innovation management models. In a networked economy, this role is particularly important in creating value provided to final customers within supply chains. From the perspective of supply chain management, innovation development refers to the process of making changes to products, services and processes that resulted in creating new value for the organization and its clients through cooperation of partners within supply network (Narasimhan & Narayanan, 2013). Therefore, the importance of purchasing function is best represented by the coupled open innovation model, that involves combining purposive inflows and outflows of knowledge to collaboratively develop and/or commercialize an innovation (Chesbrough & Bogers, 2014). Within the literature, background for these considerations constitute resource based view theory, resource dependency theory and relational competency theory. It is worth mentioning in this context that relationships developed with suppliers with a high innovation potential are perceived as a valuable, rare, unlimited and unchangeable resource (Yan *et al.*, 2017).

How to build and strengthen the role of purchasing within innovation development process? In the basic approach, a company implementing an innovation-oriented competitive business strategy chooses a closed or open innovation development model. Next, it develops appropriate functional strategies, including a purchasing strategy, indicating development of innovation as a strategic goal. The purchasing function can develop internal and/or external

collaboration, respectively with other business functions and/or suppliers. As a result of external integration, cooperating supply chain links can create coherent strategies for the development of innovation in terms of the coupled open innovation model. Their implementation requires complementarity of partners' resources and occurs through cross-functional and cross-organizational project management. Cross-functional integration leads to the dissemination of the knowledge about organizational dynamics, market intelligence and customer needs on both a departmental and individual level as well as helps to generate interdependency among functions (Murillo-Oviedo *et al*, 2019). In turn, elements of external integration with suppliers include: exchange of information through ICT, strategic partnership and joint commitment to business processes (Cousins *et al*, 2006).

Research results confirmed that emerging digital technologies are important in building the significance of purchasing function and creating its collaboration with internal customers and suppliers. At the beginning, the leading role of purchasing is underlined as a function that introduces companies into the era of digitalization, which results directly from the need to purchase technologies and services accompanying their implementation (Pellengahr *et al*, 2016). Digital technologies are transforming purchasing strategies, organizations and processes, exerting influence at the strategic, tactical, operational level of purchasing management (Kleeman & Glas, 2017). In the strategic perspective, modern technologies support internal and external integration of business functions and processes in the company and supply chain. Digital transformation leads even to the development of new business models of relationship management in supply chains. As the case study of company A proves, new models can be created on digital platforms integrating internal and external stakeholders of purchasing processes. In tactic terms, technologies transform business process management. According to the case study of company B, the Internet of Things creates the opportunity to automate business processes. At the operational level, their use reduces costs and shortens innovation development and implementation cycles. Referring to the case study of the company C, 3D printing technology enables rapid operationalization of projects and commercialization of new packaging. To conclude, the three presented case studies show that digital technologies drive both internal and external collaboration towards innovations development.

Furthermore, research results indicate that digital technologies at current and future stage of their deployment are and will be an important element of the maturity of purchasing as business function and process. As also emphasized in the literature, purchasing digitalization is based on the use of numerous and various digital technologies and their application for internal and external integration (Singh Srail & Lorentz, 2019). However, as the results of research conducted among 504 purchasing managers in 39 countries indicate, the use of modern, emerging technologies is currently at a low level (Deloitte, 2018). The most advanced technological solutions are applied by market leaders, whose best practices are worth following by others.

## 6. CONCLUSIONS

Purchasing function as a lever of innovations development can be a source of companies' competitive advantage in the 21<sup>st</sup> century. It is more and more often involved in cross-functional innovation development projects in companies and is beginning to play a leading role in them. Furthermore, it has been confirmed that suppliers are the most important partners in supply chains within innovations development, regardless of their type. Purchasing function in modern companies can enhance the competence to build synergies with suppliers. Best practices of the companies A, B, C indicate that emerging digital technologies become a catalyst of internal and external collaboration on innovation development, with proactive participation of purchasing

function. Furthermore, digital technologies transform the role of purchasing in innovation development process. This function not only buys innovations as before, but significantly increases focal company's innovativeness by collaborating with internal customers and external suppliers. Moreover, digital technologies drive both internal customers and suppliers to take the initiative and offer innovative ideas. Research results enrich the purchasing literature and business practice, emphasizing huge potential for using purchasing function as a lever of innovations in era of digital transformation.

The findings presented above are preliminary and exploratory due to the limitations of the case study method in terms of generalization. The article forms the basis for scientific discussion on research results devoted to these issues in other countries and their comparisons. There is an opportunity to conduct a multi-case study, including the analysis of other industries in different countries.

## 7. REFERENCES

- Aminoff, A., Kiviniemi, M. (2016). Driving Supplier Innovations towards Digitalization of Infrastructure Projects, *The XXVII ISPIM Innovation Conference – Blending Tomorrow's Innovation Vintage*, Porto, Portugal, 1 – 11.
- Bienhaus, F., Haddud, A. (2018). Procurement 4.0: factors influencing the digitalisation of procurement and supply chains. *Business Process Management Journal*, 24(4), 965 – 984.
- Burt, D. N., Doyle, M. F. (1993). *The American Keiretsu*, Business One Irwin, Homewood.
- Cavinato, J. L. (1999). Fitting purchasing to the five stages of strategic management. *European Journal of Purchasing and Supply Management*, 5, 75 – 83.
- Chesbrough, H., Bogers, M. (2014). *Explicating Open Innovation*, in: H. Chesbrough, W. Vanhaverbeke, J. West (ed.), *New Frontiers in Open Innovation*, Oxford University Press, Oxford.
- Chick, G., Handfield, R. (2015). *The Procurement Value Proposition. The Rise of Supply Management*, Kogan Page, Croydon.
- Cousins, P. D., Lawson, B., Squire, B. (2006). An empirical taxonomy of purchasing functions. *International Journal of Operations & Production Management*, 26(7), 775 – 794.
- Deloitte. (2018). *Leadership: Driving innovation and delivering impact*.
- Easton, S., Epstein, E. (2018). *The Future of Procurement Arrives at Last*, A.T. Kearney.
- Ferreiro, T., Zappone-Fabre, E., Cordón, C. (2014). The organizational design shift, in C. Cordón, T. Ferreiro (ed.), *The Value Chain Shift. Seven Challenges Facing Top Executives*, IMD Global Value Chain Center, Lausanne.
- Foerstl, K., Hartmann, E., Wynstra, F., Moser, R. (2013). Cross-functional integration and functional coordination in purchasing and supply management. Antecedents and effects on purchasing and firm performance. *International Journal of Operations & Production Management*, 33(6), 689 – 721.
- Glas, A. H., Kleeman, F. C. (2016). The Impact of Industry 4.0 on Procurement and Supply Management: A Conceptual and Qualitative Analysis. *International Journal of Business and Management Invention*, 5(6), 55 – 66.
- Jones, D. (1999). Development models. *Supply Management* March, 40 – 41.
- Kaufmann, L., Gaeckler, J. (2015). On the relationship between purchasing integration and purchasing decision-making speed. *International Journal of Physical Distribution & Logistics Management*, 45(3), 214 – 236.

- Kibbeling, M., Van der Bij, H., Van Weele, A. J. (2013). Market Orientation and Innovativeness in Supply Chains: Supplier's Impact on Customer Satisfaction. *Journal of Product Innovation Management*, 30(3), 500–515.
- Kleemann, C. F., Glas, H. A. (2017). *Einkauf 4.0. Digitale Transformation der Beschaffung*, Springer Gabler, Wiesbaden.
- Mena, C. (2014). Introduction: the strategic role of procurement, in C. Mena, R. Van Hoek, M. Christopher, *Leading Procurement Strategy. Driving Value through the Supply Chain*, Kogan Page, Croydon.
- Monczka, R. M., Handfield, R. B., Giunipero, L. C., Patterson, J. L., Waters, D. (2010). *Purchasing & Supply Chain Management*, South-Western Cengage Learning, Andover.
- Mogre, R., Lindgreen, A., Hingley, M. (2017). Tracing the evolution of purchasing research: future trends and directions for purchasing practices. *Journal of Business & Industrial Marketing*, 32(2), 251–257.
- Murillo-Oviedo, A. B., Pimenta, M. L., Hilletoft, P., Reitsma, E. (2019). Achieving Market Orientation Through Cross-Functional Integration. *Operations and Supply Chain Management*, 12(3), 175–185.
- Narasimhan, R., Narayanan, S. (2013). Perspectives on supply chain driven innovation. *Journal of Supply Chain Management*, 49(4), 27–42.
- Nowosel, K., Terrill, A., Timmermans, K. (2015). *Procurement's Next Frontier. The Future Will Give Rise to an Organization of One*, Accenture.
- Ocicka, B. (2019). *Rola zakupów w działalności przedsiębiorstw*, WN PWN, Warszawa.
- OECD, Eurostat. (2008). *Podręcznik Oslo. Zasady gromadzenia i interpretacji danych dotyczących innowacji*.
- Pellengahr, K., Richard, J. (2016). *Einkauf 4.0. Digitalisierung des Einkaufs*. Fraunhofer-Institut für Materialsfluss und Logistik IML, Bundesverband Materialwirtschaft, Einkauf und Logistik BME e.V., Frankfurt.
- Reck, R. F., Long, B.G. (1988). Purchasing: A Competitive Weapon. *Journal of Purchasing and Materials Management*, 24(3), 2–8.
- Schreiber, B., Janssen, R., Weaver, S., Peintner, S. (2016). *Procurement 4.0 in the digital world. Transforming procurement into an agile, linked innovation leader and catalyst*, Arthur D. Little, 1–4.
- Seuring, S. (2005). Case Study Research in Supply Chains – An Outline and Three Examples, in: H. Kotzab, S. Seuring, M. Müller, G., Reiner (ed.), *Research Methodologies in Supply Chain Management*, Physica-Verlag, Heidelberg.
- Singh Srani, J., Lorentz, H. (2019). Developing design principles for the digitalisation of purchasing and supply management. *Journal of Purchasing and Supply Management*, 25(1), 78–98.
- Stannack, P., Jones, M. (1996). *The Death of Purchasing Procedures*, PSERA, Eindhoven.
- Van Weele, A. J. (2018). *Purchasing and supply chain management*, 7<sup>th</sup> Edition, Cengage Learning, Andover.
- Von der Gracht, H., Giunipero, L.C., Schueller, M. (2016). *Future-Proof Procurement. Now or Never: The Big Procurement Transformation*, Florida State University, KPMG.
- Wagner, S. M. (2012). Tapping Supplier Innovation. *Journal of Supply Chain Management*, 48(2), 37–52.
- Yan, T., Yang, S., Dooley, K. (2017). A theory of supplier network-based innovation value. *Journal of Purchasing and Supply Management*, 23(3), 153–162.

- Yap, K., Wong, Ch. C., Koh, Y. H. (2018). *Procurement: Riding the Transformative Digital Wave*, A.T. Kearney.
- Yin, R.K., 2003. *Case Study Research: Design and Methods*. Third ed. Sage, Thousand Oaks, CA.