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THE IMPACT OF THE INTERNET OF THINGS ON NEW APPROACH IN NETWORK MANAGEMENT

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Abstract

Background. Entrepreneurial networks are established in order to achieve a competitive advantage and superior performance, due to collaboration within different levels and types of organisations. Their existence, based on alliances, cooperatives, capital relationships, etc. requires long lasting bonds and thus may not be easily adjustable. Turbulent condtitions, extended response time to occuring changes, and processes' adaptation may be an obstacle to their appropriate functioning. As a proposal a new approach emerges, which is associated with the concept of the Internet of Things (IoT), favouring redefinition of the market, buyers, users, and product range.

Research aims. The main aim of this article is to present an innovative attitude to network management, based on communication and platforms' integration, due to the IoT approach. In this regard the paper will show functioning regularities of contemporary networks in a turbulent environment, followed by an analysis of examples used as an illustrative material of smart objects and solutions underlying creation of intelligent shopping, processes' integration, automation, and personalised packaging, that allow for more flexible and unconventional network management.

Methodology. The paper presents a literature review and an analysis of secondary data resources and it also bases on available case studies of the IoT implementations.

Key findings. Nowadays, available literature as well as business consider network management as a constant and formalised relationships' dependency and they are more eager to follow trodden schemes. In the proposed new management approach, the network shall be rather perceived as a dynamic solution, created ad hoc by customers using companies' products and available applications. Therefore, to overcome the above mentioned schortcomings, organisations should go beyond standard solutions, introducing unconventional ideas and thinking. Such attitute may not only constitute a competitive advantage of flexible management, a more versatile approach, but it will also open a new business window to a lucrative market, with

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an estimated potential economic impact growth annual ratio to be between $2.7 to $6.2 trillion per year by 2025.

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INTRODUCTION

Entrepreneurial networks, regardless of their forms, management methods, and cooperation levels are established in order to achieve a competitive advantage and superior performance, based on collaboration within different levels and types of organisations (Delener, 2012; Baum & Rowley, 2008). Their existence, based on partnerships, alliances, cooperatives, capital relationships and multilevel dependency (Kitzi, 2004) require long-lasting bonds and thus may not be easily adjustable.

The network structure is used in modern organisations that are breaking with traditional solutions and introducing new ways of management, as they base their functioning on project teams and a subordination network (Doepfer, 2012). The reasons for formation of such networks are primarly changes resulting from the development of an IT network, secondly a new perception of the organisation's environment and thirdly the boundaries blurring between the company and its environment, so typical for intelligent and virtual organisations. As B. Noteboom (1999) rightly points, such networks can however not only be created by internal division of the mother organisation into smaller units, but also arise on the basis of previously independent units or parts' integration, or finally by subsidiaries' extraction.

Network-management in this regard encourages the disintegration of the traditional and fossilised skeleton of an inflexible organisation in place of which smaller, more dynamic, and more efficient creations are generated. Such units are characterised by a large independence in the decision-making process, reaction speed, and more efficient management.

The strengths of such networks' creation, which may be, for example: increased know-how, economy of scale, logistic supply chain construction, increased communication potential, or larger financial

possibilities are generously listed by many (Greve, Rowley & Shipilov, 2014). Glorification of the phenomenon occurs to such an extent, that Sroka and Hittmar (2013) claim, that alliance networks should occupy a preeminent position on the agenda of both academics and practitioners in the strategy field.

At the same time, such approach may unfortunately be associated with certain drawbacks. Due to the turbulent condtitions of the micro-and macro environment, the only constant for these networks seems to be change. For this reason, extended response time to emerging changes or the necessary period for processes' adaptation and arrangements' modification that may lead to explicit disqualification in the race for market leadership position may serve as examples of the previously mentioned disadvantages.

Therefore, in order to minimise the impact of the factors mentioned above, the current approach to network business management should be seen from a complately different perspective. The network shall not be considered as a constant and unchanging dependency of relationships between entities forming them, but rather as a dynamic solution, created ad hoc by customers using companies' products and applications available within the market. With the implementation of such approach the potential of the network will not increase linearly with each new partner/consumer, but rather in accordance with D.P Reed's – the Law of The Pack, concerning communication within the social media* (Tarabasz, 2012). Moreover, such opportunity should not be considered as science fiction, as these emerging solutions are now available almost at one's fingertips. A simple change of a point of view is sufficient in order to enter the blue ocean strategy and open a new business window. Organisations should go beyond standard solutions, relations, and proposals, introducing instead unconventional and extraordinary approach and thinking.

The main aim of this article is to present the author's innovative attitude to network management, based on communication and platforms'

* Contemporary social networks follow D.P. Reed's Law (also called the Law of the Pack) which recognizes the importanceand impact of groups within social networks (Evans, 2012). According to the author of the theory, the power of the network grows more powerfully compared to what D. Sarnoff or R. Metcalfe proposed, as groups (subsequently becoming social communities) create interconnections that increase enormously the power of the communication network. That is why Reed's network of 10 people is 2^{10} (=1024) times more valuable compared to 10x multiplications proposed by D. Sarnoff or 100x, offered by R. Metcalfe.

integration, owing to the IoT approach. In this regard, the paper will show functioning regularities of contemporary networks in a turbulent environment, followed by an analysis of examples used as an illustrative material of smart objects and solutions underlying creation of intelligent shopping, processes integration, automation, and personalised packaging. Such attitude and an unconventional approach scopes at allowing for more flexible and unconventional network management and from this point of view it may constitute a basis for competitive advantage and thus remains the foundation for more effective contemporary management.

DEFINING THE INTERNET OF THINGS

A proposal for such a new attitude, underlying the focal point of this article, favouring a redefinition of the market, buyers, users, and the range of products, emerges as the approach associated with the concept of the Internet of Things (IoT), interchangeably known as the Internet of Everything (IoE) or the Internet of Objects (IoO). The autorship of the term is assigned to Kevin Ashton, who used it in 1999 (Ashton, 2009) while working at P&G in his presentation for the executives. The practical application of the theoretical solutions of the IoT took place at the turn of the years 2008/2009 (Cisco IBSG & Evans, 2011). Moreover, the year 2009 was the first, when the numer of networked devices exceeded the number of the Earth's inhabitants.

Nowadays, it has to be understood, that regardless of the origin of different IT support, online communication tools, technologies, and solutions, the IoT among others, both as a whole and each individually, are closing the gap between the world of bytes and the world of objects (Antonova, 2014).

According to International Telecommunication Union's Global Standards Initiative (ITU, 2012) this emerging solution, the Internet of Things is a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies. They also include in their approach a broader perspective, in which the IoT can be perceived as a vision with technological and societal implications. It is worth underlining, that such approach, though it is quite a new idea, was defined far

much earlier by Nicola Tesla in 1926 who considered the existence of a solution "when wireless is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole (…) and the instruments through which we shall be able to do this will be amazingly simple compared with our present telephone. A man will be able to carry one in his vest pocket" (Kennedy, 1926). And even though, this quotation is almost 90 years old, it shall be highlighted how well he reflected both the current reality and the future opening up before our society.

Closer to the article author's attitude, than the one presented by the Telecommunication Union's Global Standards Initiative and foreseen by Tesla, is Chaouchi's (2010) approach who rightly points that the IoT is rather about designing new services and generating new streams in the communication value chain. That is why he considers it to be one step further on the leading path to a smart world with ubiquitous computing and networking. From such point of view, IoE constitutes a meeting point between the real and virtual worlds, especially when combined with other technologies, such as sensor technology or mobile communication.

On the other hand, there are more "technical or mathematical" approaches. For example McEwen and Cassimaly (2014) introduced an equation for the Internet of Things, which defined the idea as a total of physical objects, controllers, sensors, and actuators combined with the Internet.

Such approach is very similar to the one presented in McKinsey's (2013) report, according to which the IoT refers to the use of sensors, actuators, and data communications technology built into physical objects – from roadways to pacemakers – that enable those objects to be tracked, coordinated, or controlled across a data network or the Internet.

But the IoE seems to be something far more explicit and complex than simple words quoted above. Many useful guidelines are for example presented by Pfister (2011) who proposed a step-by-step technical approach, an imaging guide on creating of an IoT environment, network, and communication links. The previously quoted Chaouchi (2010) also emphasises the importance and complexity of the phenomenon: implementation of RFID (radio-frequency identification) technology, sensors, nanotechnology, and robotics. All this in order to make the IoT services an interdisciplinary field where most of the human senses are somehow reproduced and replaced in the virtual world.

It has to be underlined, what was clearly done by Best Computer Science Degrees (2015), that not all of IoT things are directly connected to the Internet. Some objects, such as sensors, communicate wirelessly with each other in an M2M (machine-to-machine) system over a localised network, and to some sort of base device which is Internet-connected. Other communication forms include equally machine-to-person (M2P), P2M (person-to-machine) as well as communication between person-to-person.

What is far more interesting, these are the possibilities given by wireless communication technologies for non-autonomous things (sensors for example) that include RFiD, NFC (Near Field Communication), Wi-Fi, BLE (Bluetooth Low Energy), XBee (radio module), Zigbee (low-power digital radio), or Wireless M-Bus (protocol software allowing RF communication) amongst others. To communicate via the Internet these devices may require an IP (Internet Protocol) address to uniquely identify a particular object*.

This complicated technical background establishes, from the point of view of an average user, the ubiquitous network of smart objects, allowing human-to-human (H2H) communication, at the same time in reality reduced to M2M or O2O (Object-to-Object) information interchange. Such data flow, acording to McKinsey (2013), constitute three steps in Internet of Things applications: (1) capturing data from the object (for example, simple location data or more complex information), (2) aggregating that information across a data network, and (3) acting on that information – taking immediate action or collecting data over time to design process improvements.

However, the unnoticed miracle of a continous, difficult technical process, underlying the focal point of the innovative proposed approach, is covered by the "grayness of everyday life": occuring as the ease of use, 24/7 indissoluble presence of smart objects and communication convinience. And even though these words may for some sound too futuristic at the moment, it is difficult enough to imagine our life without a smartphone and the Internet. What is more, this phenomenon

* Because the IPv4 (Internet Protocol version 4) system, used by majority of computers and older-generation smartphones, is limited, at the beginning of 2015 technology gained a new possibility – the new IPv6 system, under which addresses are longer, and the maximum number of unique IPs is approximately 3.4 × 10^38. For that reason even with rapidly growing demand on IP addresses we will not cover new possibilities, as this number, according to Cisco, is an equivalent for 100 IPv6 addresses for every atom on Earth (Best Computer Science Degrees, 2015).

significantly exceeds beyond the original expectations. What was initially considered to be a "technology trigger" in the Gartner Hype Cycle for Emerging Technologies in 2011 (Postcapes, 2011), three years after, in 2014, constitutes the major point in a "peak of inflated expectations" (Postcapes, 2015b) and its mainstream adoption is anticipated for incoming 5–10 years.

THE IOT EXAMPLES

To understand the inner potential of the IoT, still lying dormant, it is necessary to indicate two numbers. There are currently over 3 billion Internet users worldwide and at the same time there are 25 billion objects (Cisco IBSG & Evans, 2011) constituting the Internet of Things. Moreover – the last data indicates the number of plugged items that constitute solely the 1% fraction of all existing devices, that could be networked!

Smart objects, sensors, locators and wrist-bands or arm-bands, and appliacations compatible with them, underlie the creation of intelligent shopping, processes integration, effective buying process, automatic alerts, personalised, intelligent packaging, profiled advertisement in VOD, or even the existence of smart cities. Such activities occur already at a superior scale in smart cities, transportation, and ecology domains. At the same time, they only reveal the proverbial "peak of an iceberg", as the remaining part that constitute the majority of the phenomenon, remains hidden.

The sectors in which at the moment IoT develops the most dynamicly are: fitness, FMCG (with special emphasis for fresh, especially bio and eco products), home appliances and lifestyle devices, smart parenting, TV, ecology, and communication (Sales Manago & Benhauer Marketing Technologies, 2015). The following part of the chapter will compose of the IoT exmeplification, in order to visualise the possibilities hidden in the proposed solution.

Devices from the fitness group, are now, beyond smartphones and tablets, top-selling smart-objects. Depending on their complexity, they may monitor the physical activity (*Apple Watch*, *Sony SmartBand*, *Basis Peak*, *LG Watch Urbane*), track progress of performed exercises or movements intricacy (*Notch*, *Garmin Forerunner*) and even arrange training plans (*Tao Wellshell*). Not only they can passively monitor

and present interesting data (like *Tinke*, that i.e. indicates the heart rate, blood oxygen level, and breathing rate, by a simple touch of the thumb), as the range of their possibilities grow continously. The most interesting is the fact, that slowly they become fully independent devices, that do not need to have, as so far, a continuous smartphone connection.

More and more often, customers want to monitor everything and everywhere. For example *Kolibree* is the world's first connected toothbrush, which collects data about our habits and reports a need to improve; especially bought by parents to their children. *HAPIfork* is a networked fork, which helps alerting at too rapid eating, helps introducing new nutritional habits, and monitor them.There are paramedical solutions like *Adhere Tech*: intelligent packaging for drugs, which verifies if the patient has already received a dose of a given medicament; Google's soft smart lenses' project, still in the testing phase, which measures the glucose level. Such solutions are more and more often present in smart parenting – smart clothes or diapers, which inform about inapropriate temperature and humidity.

However, nowadays smart objects become independent: either they are launched themselves, like *Kapture* and *Autograph* (for the perpetuation of special moments as picture, audio or video form) or disable, like *Nest* (a profitable venture, bought by Google), an intelligent thermostat, that learns the user's preferences and behaviors and switches itself off, when nobody is at home. But what becomes the most important, the IoT extends far beyond simple objects and creates a real network of omnipresent smart objects, that instead of exchanging information, may in close future independently draw conclusions!

Far less intelligent in such approach is the refrigerator, which warns us when a product is depleted and can be remotely turned off, from the one, that is integrated with online shopping capability from a chosen company or even sends an order to a chosen store for a refill.

The above-mentioned solutions only serve to exemplify the possibilities of the phenomena on a micro scale. In fact only single objects were shown, which full potential is visible only when combined in groups. If, however, talking about sets of beacons, sensors, and detectors, the space around will come alive and become intelligent. This happens in the case of the Smart Cities and Smart Eco-world approach. Already, such solutions introduced on a large scale, show real savings to be achieved. The *London Underground* could serve as an example. Here

all data from sensors and intelligent edge devices, which monitor temperature, vibration, humidity, fault warnings, and system alerts, are available in one central location in order to provide access to the required information on mobile applications, via a Web browser or through text alerts (Microsoft, 2014). This information in the aging transport system are about to improve customer service, by enhancing operational efficiency by 30% over three years (Cruz, 2014)

In case of *Helsinki Bus Transportation* by improving the ability to capture and track traffic data, driver performance, and gas usage, the company obtained 5% savings in fuel costs due to more careful driving and improved maintenance. However, this this number becomes more impressive when we realise that the company uses approximately 3 million gallons of gasoline per year, in a country where gas can cost up to three times as much as it does in the United States (Bhandari, 2014). Such attitudes, create step by step a leading path to the desired solution and transform a theoretical approach to real data and tangible profits.

A REVOLUTIONARY APPROACH IN NETWORK MANAGEMENT

Unwilling to remain passive, seizing the occurring chances arising due to the rapid changes in the business environment, which the catalyst is the Internet, the company network management shall anticipate the current development trends. Instead of thinking about joint logistics and production, in order to minimise costs, would it rather be worthwile to spend funds on R&D and create a common communication platform? The previously mentioned refrigerator, indepedently placing an order on particular goods, shows the correct development direction, coherent to the proposed approach. *Integration* and *communication* are the two key components of this approach. Customers in the incoming future will not desire products, that simply can be remotely controlled, but will rather prefer solutions which simplify their daily functioning. For example, while searching inspiration for an ideal dinner recipe, enough would be adding ingredients to the chosen application (folowing the pattern of existing "share buttons"), compatible to own household appliances. In the feedback the refrigerator would be able to provide a list of the missing components and then automatically place a purchase

order in a store indicated nearby (and all this under the assumption of having a shopping cart optimisation possibility and benefiting from promotion/sale options). The purchase would be directly delivered to the desired address or collected on the way back from work, justo in order to arrive home with the accurate temperature and humidity and start working in the kitchen, where the oven has already been heated. Yet it it is only the beginning. Why not connect the already existing items? Fair enough, similar "wishlists" shall be submitted by kitchen cabinets (when missing flour, sugar, oil, etc.). No more hassles concerning women's wardrobes and the perpetual "I do not have anything to wear". Viewing online journals with fashion inspirations should allow the verification of "what else is still missing" to a perfect styling and then beacons and sensors* will allow for precise location of the coveted pieces of clothing.

Beacons are tiny transmitters (their cost ranges from several to about a dozen $ per unit) with a range of approx. 100 m, consisting of a chip and a battery; with a good configuration they can operate for even two years. They use BLE Bluetooth 4.0 (Bluetooth Low Energy), in which newer generation smartphones are factory-equipped, including all the iPhone (4S or higher) and Samsung (S3 and the following). The transmitter sends a specific signal which compatible devices recognise as three UUID numbers. The first one usually identifies the type of service and the two additional ones, corresponding to a recognition function, which further shall be provided with appropriate software. One of the biggest advantages of these beacons is the ability to determine the transmission range (due to dynamic configuration transmitter power, through programmable TX power software) (Okopień, 2014; Lalik, 2014). Depending on the needs, its range can be continuously adjusted and thus induce the desired interaction. Very often dedicated software is written, which utilizes a device's full capabilities. This allows for example for storing literally "greeting customers", or enables showing them the way to the desired location (section or specific product). Beacons and iBeacons (the Apple product) were placed in *Apple Stores*,

* A sensor can be treated as „eyes and ears" of the IoT system. Their role is to transfer particular data (information about temperature, humidity, altitude, heart rate, blood pressure, etc.) to the receiver (other smart object). The sensor requires ultra-low power, which allows it to last far much longer on batteries, than a standard radio transmitter. The *50 Sensor Applications for a Smarter World: worth visit* (Libelium, 2015) illustrates the possibilities of the solution.

inMarkets and *Shopkicks*. Also, *Macy's* stores have already created a dedicated application, which not only informs about promotions, but what is much more important, facilitates locating specific products within. Beacons can be used to perform wireless payment, usually authorising transactions by the fact that a smartphone with Bluetooth 4.0 itself may become a beacon and though transmit desired signals. PayPal, for example, is preparing own devices for such payments, as they do not require physical contact with the terminal. Therefore, the situation in which the customer enters the store, selects preferred goods, and pays for them not even approaching the cashier, at the same time being immediately provided with confirmation and the bill on a smartphone, sounds not only possible, but what is far more important, may be quickly accomplished.

However, beacons are items not only used for pure pro-sales activities. Nivea used them as part of an unconventional campaign. An advertisement in a women's magazine included a special band with a beacon that was made to be applied at a child's arm. After downloading and installing the application on their smartphones, parents cluld be able to watch over their children, at the same time, being able to freely enjoy sunbathing, because when the child wandered off, an alarm was enabled. On the beacons' basis dedicated solutions for the objects location or even animals (*Tile*) were established. At the same time, work under the project *Behere*, which is dedicated to universities, is continued. Within its framework beacons allow checking courses' attendance and rapid teaching materials' exchange between the lecturer and students.

However, "all that glitter is not gold". The darker side of the idea are the costs. Even though, regardless of the high level of investments on R&D into the idea of IoE, it will provide quick and high ROI (Return on Investment). Instead of advertisement targeting to a wide audience, due to processes' integration, automatic alerts, via personalised, intelligent packaging we are heading towards a more effective buying process. Why not consider a profiled advertisement in VOD? Why not invest in a system of beacons, conducting and directing customers straight to desired products, instead of losing their time on a fruitless search. When digital self-service via banking transactional system was introduced, only few were able to look beyond the long-term reduction in customer service costs outside the bank branch and

forsee crosselling via digital channels, automatic granting of a credit line for online shopping and moreover – payments done by objects of everyday use purposes (telephone, watch, etc.).

TO FORESEE THE FUTURE – THE ELECTRIFICATION OF THE 21ST CENTURY

Nowadays, Internet access is not granted to people only. According to eMarketer forecasts (2015) for the year 2015, there are 3.07 billion of Internet users worldwide, that constitute a 42.4% penetration ratio of this medium, whereas there are 15 billion of already plugged devices. Moreover, this number will increase rapidly, as according to Best Computer Science and Postcapes (2015) 200 billion of such items are foreseen by the end of the year 2020.

These numbers, quoted above, are not only to show the magnitude of the target users' group, but more importantly to indicate the power of a real market value they constitute. McKinsey (2013) in its reports estimates the IoT potential economic impact growth annual ratio to be between $2.7 to $6.2 trillion per year by 2025. According to Best Computer Sciences Degrees (2015) the global IoT market (technology and services, gross revenue) was $4.8 trillion for the year 2012. Moreover, this type of solution will increase rapidly, as the total of $8.9 trillion is the expected market worth for the year 2020, which gives a CAGR (Compound Annual Growth Rate) of 7.9%. According to the previously mentioned McKinsey (2013) the largest influence on the IoT market worth is anticipated in the health care and manufacturing sectors.It is worth mentioning that the first of the mentioned sectors will provide us with an economic impact of $1.1 trillion to $2.5 trillion per year by 2020.

For this particular reason, Samsung has announced,that by 2017 all of their TV sets will become IoT appliances (Sales Manago & Benhauer Marketing Technologies, 2015). Moreover,within five years the company's computer equipment will be ready for action in this system. To achieve this aim they declared $100 million for investments in R&D. The most important is the fact that such amount will be involved not only in the improvement in Samsung's own products, but also dedicated to research on communication platforms between different companies and their smart appliances.

Through these efforts' example, the company follows perfectly the development direction and manner of investing resources in R&D. But, most importantly Samsung is not an isolated case, because at the moment, 96% of 800 major business leaders declare introduction of IoT solutions soon and 68% claim their current use (Sales Manago & Benhauer Marketing Technologies, 2015).

Despite the fact of increasing awareness and growing investments in this field, 99% of existing devices are still not connected to the Internet. Worth though recoursing appears the constatation of Matt Webb, the CEO of BERG that "the web getting inside physical things is the 21st-century equivalent of electrification" (Wired, 2013). This process will therefore be equally long as expensive and certainly involve a huge civilization leap, providing completely new opportunities and breaking previously defined paradigms. Although the statement by M. Webb may not enchant with its form, however, it clearly reflects the scale of challenge both for large corporations, business networks, as well as companies from the SME sector.

Network enterprises, in particular, may take advantage of this 21st century equivalent of electrification. Indeed, it is the Internet allowing for convenient and fast communication and working in project groups with participants functioning even in different time zones. With an integrated digital approach, the matter of time and space becomes almost secondary. However, if the current solutions are enriched by the IoE approach, literally and figuratively, W. Chan Kim's (2015) sphere of blue ocean unlocks for businesses. The idea of full JiT (Just in Time) automation within the framework of integrated ERP (Effective Resource Planning) approach, with the IoT idea application, may serve here as an example. As Van Heur (2015) rightly observe, "the Internet of things could make ERP flexible, intelligent, and real-time (…) [because] it will becomeits eyes and ears". Similar to this approach are Meyer, Ruppen and Magerkurth (2013) who correctly assert that the IoT smart-devices will take part in ERP systems as new ressources' type in the business process.

But, for companies, especially those managed as a network, the proposed approach and the IoT impact on their ERP system may entail far more significant consequences. In many cases it is currently impossible to systematically identify inventory in real time, instead providing only a closing balance from the previous day as an opening one for the next day. By proper integration of the proposed solutions

an online preview state of goods supply/materials would be available. Such action, however, resembles watching the giant cathedral by the proverbial "keyhole". However, it is the direction of paving the way for the outstanding possibilities the company is facing.

It is sufficient to imagine a case of minimising the response duration to complex offer inquiry for the product that has not been manufactured, yet. In the proposed case it could therefore be immediately concluded what already exists within the current inventory (both in the main warehouse and stores/offices scattered throughout the country), which is already physically located on the stock of a subcontractor, is due for shipment, or is in the production process (and when it will be ready). Combining these data with the process of production plans on an ongoing basis, we could provide a potential client with feedback concerning the necessary period to complete the offer with the desired product and time of its delivery. And most importantly, it does not require excessive expenditure related to both time and work. But, certainly such high responsiveness and its pace and the possibility of progress monitoring, could be one of the key drivers of building the competitive advantage, both the network as whole as well as each of the undertakings individually. Moreover, as Van Heur (2015) adds, the IoT impact on the supply chain can lead to greener and more sustainable practices. All this due to the fact, that in the IDC Report (Turner *et al.*, 2014), by 2020, 40% of all available data will be machine-generated, with 20 to 50 billion devices fuelling that growth.

Thus, the considered attitude and the IoT may be a milestone for the functioning of modern enterprises. And plugging into the Internet devices, still not networked, can lead to diametrical changes within companies' functioning, being actually in the 21st century an equivalent of the old electrification process and constituting a kind of a springboard for the next civilizational leap.

CONCLUSION

According to the existing approach (Sroka & Hittmar, 2013), nowadays network companies present the standard attitude (Schwartz, Byrne & Colaninno, 2008), by focusing on building a competitive advantage, they concentrate on the optimisation of the production processes and sales, investing in own network activities, their logistic supply chains,

modification of marketing activities, etc. (Greve, Rowley & Shipilov, 2014). Usually, therefore, they implement or just simply continue solutions, which to a greater or lesser extent, are implemented by almost all the companies within the existing market (Clark, 1993). Thus, an approach that would involve investing and supporting competitive enterprises would probably be the last step, for which they would have been ready to decide. In such attitude, from a theoretical point of view, investing in common platforms, shared sotware, processess standarisation and consistent communication, allowing subsequent actions coherency, appear pointless. During the discourse presented in the paper, it was however demonstrated that deviating from standard behaviour in a saturated product market may generate new opportunities. For this particular reason, a simple change of the view point is sufficient in order to enter the blue ocean strategy (Kim & Mauborgne, 2015) and may open a new business window (Kozielski, 2013). Therefore, organisations should go beyond standard solutions, relations, and proposals, introducing instead an unconventional and extraordinary approach and thinking. As usual, including here, the brilliance of the described solution lies in its simplicity.

Proposed in this paper, emerging as a proposal and unconventional for the existing network management is the new approach, associated with concept of the Internet of Things (IoT). This non-standard and unorthodox solution, though, on the one hand, being complicated and sophisticated from a technical point of view, on the other hand, from the users' aspect, is defined with facilitating, convinience, and ubiquity. To attain this level of excellence and shift the old paradigm of the red ocean strategy approach, the IoT is favouring a redefinition of the market, buyers, users, product range, automation, and personalised packaging amongst others.

According to eMarketer (2015) forecasts for the year 2015, there are 3.07 billion Internet users worldwide, which constitutes a 42.4% penetration ratio of this medium, whereas there are 15 billion of already plugged in devices. Moreover, this number will increase rapidly, as 200 billion of such items are foreseen by the end of the year 2020. Despite the fact of increasing investments in this field and estimated potential of IoT to be between $2.7 to $6.2 trillion per year by 2025, still 99% of the existing devices are not connected to the Internet. With such a surge in the interest in the phenomenon of the Internet of Things, companies should not remain indifferent to it. Their passivity, at

such a development pace of this trend may indeed not only determine their chances to acquire as high as possible competitive position in the market, but even render their "to be, or not to be".

Indicated by the unconventional approach to network management, proposed in this article, underlines the fact, that contemporary companies should not therefore focus around building the increasingly more perfect network of internal connections, improving management techniques, verification of economic calculation only within their own capital group. Switching to the proposed attitude, by choosing the Internet of Everything, allows such organisations to reasses the focal point and major axe of the company's functionning. The proposed IoT approach indicates as a focal point network capabilities, instead concentrating around existing, fossilised organisational forms. Implementing the solution proposed in the article, companies should rather actively anticipate changes, thinking by categories of customer needs, even at the expense of their creation, foreseeing the level of comfort desired by consumers in the long term. Under the suggested approach convenience, precision, effectiveness, ubiquity, and 24/7 availability should thus become the determinants of their functioning, such as desired in network management (Delener, 2012). By adhering to the guidelines proposed in this paper, the choice of network forms becomes of secondary importance, as such bonds will be occurring as ad-hoc combinations that underlie the primary aim, which is shaping the limitless development of network capabilities. As this unconventional attitude is a novelty in the literature and though it breaks the paradigm of the current approach, further research and potential development axes constitute, therefore, the direction of future studies in this field.

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NOWE PODEJŚCIE W SIECIOWYM ZARZĄDZANIU PRZEDSIĘBIORSTWEM POPRZEZ INTERNET OF THINGS

Abstrakt

Tło badań. Tworzenie przedsiębiorstw zarządzanych sieciowo ma na celu osiągnięcie przewagi konkurencyjnej i ponadprzeciętnych wyników dzięki współpracy w ramach różnych typów organizacji i szczebli zarządzania. Ich istnienie bazuje na różnego rodzaju aliansach strategicznych, kooperatywach i zależnościach finansowych, przez co nie są one zazwyczaj wysoce elastyczne. Turbulentne otoczenie, wydłużony czas reakcji na rynkowe szanse i czas wymagany na proces adaptacji wydają się realnymi przeszkodami w ich codziennym funkcjonowaniu. Rozwiązaniem jest nowe podejście związane z ideą Internet of Things (IoT, tzw. Internet Rzeczy), sprzyjające redefiniowaniu pojęć rynków docelowych, wachlarza produktów oraz grona nabywców i użytkowników.

Cel badań. Głównym celem jest zaprezentowanie innowacyjnego autorskiego podejścia do sieciowego zarządzania, bazującego na komunikacji i integracji platform, wykorzystującego rozwiązania z zakresu IoT. Artykuł zaprezentuje w tym celu przykłady inteligentnych obiektów i rozwiązań tworzących podwaliny tworzenia inteligentnych zakupów, integracji procesów, automatyzacji, personalizacji opakowań, co finalnie pozwa na bardziej elastyczne i niekonwencjonalne zarządzanie siecią. Takie podejście nie tylko stanowić będzie o przewadze konkurencyjnej firmy, uelastycznieniu metod zarządzania, bardziej wszechstronnej postawie, lecz także otworzy okno biznesowe do lukratywnego rynku, o szacowanej wartości rocznego wzrostu na poziomie od 2,7 do aż 6,2 billiona dolarów do roku 2025.

Metodologia. Artykuł opiera swe rozważania na przeglądzie dostępnej literatury przedmiotu i analizie źródeł wtórnych, jak również studiów przypadków z zakresu wdrożeń IoT.

Kluczowe wnioski. W zaproponowanym innowacyjnym podejściu sieć nie powinna być postrzegana przez pryzmat sformalizowanych i skostniałych, statycznych zależności, lecz jako dynamiczne i elastyczne rozwiązanie, tworzone *ad hoc* przez klientów używających produktów i aplikacji poszczególnych firm. Dlatego też tak ważne jest, by poszczególne organizacje wychodziły poza standardowe rozwiązania, wdrażając niekonwencjonalne idee i nieszablonowe podejścia.

Słowa kluczowe: Internet of Things, sieciowe zarządzanie, innowacje technologiczne.