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WILD CARDS METHODOLOGY FOR THE COMPLEX PHENOMENA – SUCH AS THE INTERNET OF EVERYTHING

Key words

Wild cards, uncertainty, Internet of Everything, future studies.

Summary

The main aim of this article is to present characteristics of a new methodology for the identification and analysis of wild cards, using grounded (selected) methodical achievements of future studies, in particular, the Delphi method, SWOT analysis, STEEPVL analysis, and the method of weak signals. The novelty of this approach refers to (1) minimizing the subjectivity effect and (2) using a complex approach to study phenomenon. An additional aim is to characterize the practical application of the new method in analysis for the complex developing phenomenon – the Internet of Everything. This complexity affects the occurrence of many areas of uncertainties. In the author's opinion, the use of a comprehensive analysis of prospective areas whose development is burdened with a high degree of uncertainty will minimize this phenomenon (uncertainty) through multi- preparation for sudden changes. According to the author, by the implementation of the elements of the above-mentioned research approaches, to the methodology of the analysis of the unprecedented events, it is possible to popularize the process of the exploration of wild cards, especially in a Polish (Central European) research environment.

Introduction

For about forty years, the scientific field of management has been dealing with finding answers to the question about organization in an increasingly unpredictable environment in the context of preparing for an uncertain future [27].

It is vital to have knowledge that can be useful in an environment exposed to unique events and emergencies, such as global financial crises, political volatility, floods, terrorist attacks, technological breakthroughs, or new economic solutions [10]. One of the methods that facilitate such analyses is wild cards. They are descriptions of phenomena with a very low probability of occurrence, but with very serious and unusual consequences. The scope of the impact of wild cards is infinitely wide, affecting many other events; therefore, they should not be ignored [19, 20].

Despite the fact that the analysis of the wild card has special recognition in a well-established research methodology of foresight, [5, 19, 20] the analysis of A. Kononiuk and A. Magruk indicate that only some methodologies of their identification may be found in the existing published works [10].

In this article, in the context of the unprecedented events, the Internet of Everything (IoE) is analysed, which is a revolutionary Internet network that connects everything with everything: things, people, data, processes, and the animated and inanimate world.

The concept of IoE is treated in the article as a large, complex, and dynamic system. This concept goes beyond the area observed and included in revised knowledge. This raises significant uncertainty regarding future circumstances. Uncertainty can be applied to different areas of the IoE, e.g., technological, social, economic, scientific, etc. [16].

1. General characteristics of the of "wild card" method

Events in history show that the past is a conglomeration of various fugitives, circumstances, accidents, crises, upheavals, and turning points. The occurrence of such events change current development makes it necessary to take into account anticipatory, multi-dimensional, and multivariate possible future states of the environment. A. Kononiuk defines the events disturbing trends as unprecedented events or those that, under the circumstances, occurred for the first time. In this article, unprecedented events are treated as wild cards. In practice, the development study of various phenomena, wild cards are considered relatively rare. This may be due to a lack of public tools of analysis or the lack of knowledge on the subject [11].

Wild cards are descriptions of future events, unrecognisable, *ex ante* of past information, strange, original, or surprising, but with very significant consequences and a positive and/or negative connotation. They affect the

transformation of the trajectory of the analysed events and situations, change the basis, and sometimes the paradigms. They create new ways of development (both in quantitative and qualitative terms), which then give input for additional challenges and opportunities. Wild cards are usually conditioned by culture, which means that the selected abnormal events are surprising to some researchers but not others [11, 26].

The occurrence of wild cards may affect previously functioning trends as follows [12]: (1) the radical breakdown of the trend; (2) the slow breakdown of the trend; (3) sudden slump and continuing the trend; (4) slow growth trends; and, (5) a sudden increase and continuation of trends – step push-up type of wild card.

Stages of the process of identifying wild cards used in the project iKnow [24] are as follows [17]: (1) Creative identification of a potential wild card, in the framework of expert panels on the basis of their experience, knowledge, literature review, research, and desk research; (2) Evaluation of wild cards (made by a second team of independent experts), proposed in stage 1, including their originality, importance, potential impact on selected aspects; (3) The selection of the most important wild cards from the previous stage and the possibility to creating new wild cards by experts from phase 1 and 2, in the course of research workshops; (4) assignment of selected wild cards – based on the experience of an expert – weak signals (this method is briefly described in section 2 of this article); (5) The determination of the potential impact of a wild card on selected aspects, such as infrastructure, human life, legislation, economics, defence, politics, the environment, science, and technology; and, (6) the dissemination of research results in the widest circles of audience.

This methodology is laden with subjective analysis of individual areas of human activity. For analyses of complex phenomena, the Internet of Everything (discussed later in this article) methodology has the drawback of limited complexity in the analysis. In the author's opinion, the use of complex analysis of areas which development is burdened with a high degree of uncertainty can help this phenomenon (of uncertainty), minimized through preparation for many sudden changes.

Wild cards can have both an external nature for the studied phenomenon and an internal procedure [11]. For the objects such as the Internet of Everything, it seems essential to include two perspectives in the analysis, which requires taking into account the wider range of the methodical spectrum.

2. Characteristics of innovative methodology for the identification and analysis of wild cards

In this article, the wild card is treated as a potential unprecedented event *per se*. According to M. Barber, wild cards are not a method in itself, but a tool that enriches other methods. M. Barber distinguishes three main functions of wild

cards: (1) the stimulation of creativity, (2) expanding the perception of reality, and (3) a change thought patterns [1]. According to the author of this article, each of the methods proposed as part of an innovative methodology (Figure 1) could strengthen these three functions by supporting the process of identifying wild cards.

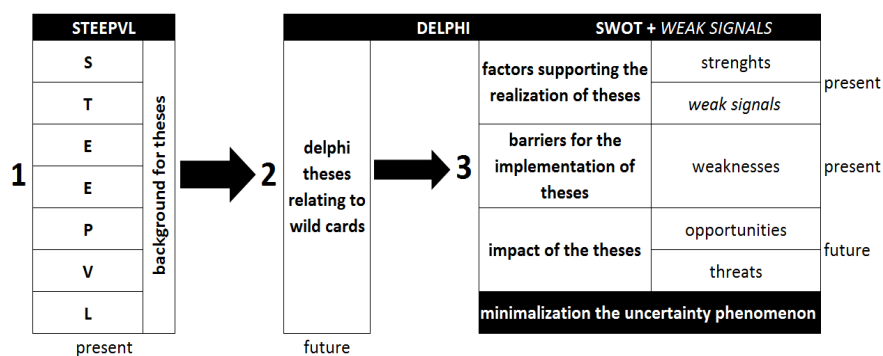


Fig. 1. Innovative methodology of the identification and analysis of wild cards
Source: Author.

An innovative methodology of identification and analysis of the wild card consists of 3 stages using well-established (for decades) research methods, such as STEELPVL analysis, Delphi (some of its elements), SWOT, and the weak signals method. In the author's opinion, through the implementation of the above methods, it is possible to minimize the subjectivity effect, typical to previous research attitudes.

In the first stage, we use STEELPVL analysis to build a multi-factor range for the identification of unprecedented events in the Delphi analysis in the following external (in relations to research object) areas: Social, Technological, Economic, Ecological, Political, Values, and Legal. In the case of very complex phenomena in which these spheres are an integral part of the study area, this method can also be used to identify the internal factors. In this methodology, analysis STEELPVL can be also used to impart the complexity of the SWOT analysis [21].

In the second stage, we can identify the wild cards by creating Delphi theses. It is a kind of examination based on expert knowledge, experience, and intuition; therefore, this method generates the greatest subjectivity effect. In this stage, consensus based human judgments are treated as a legitimate and useful contribution to the formulation of predictions about the future and to solve complex problems in a situation of uncertainty. It should be noted that, in the author's methodology, the selected functionality of the Delphi method can be used, which means that the long process of anonymous surveys of experts is indicated, but not necessary. In this methodology, Delphi analysis should be used to predict the distant processes or phenomena of a wild card, for which

knowledge is inadequate or uncertain. There is no reliable data, so that these problems do not lend themselves to precise analytical techniques [7, 13].

SWOT analysis as a comprehensive method used to analyse the environment of the object and its interior [21], which complements the Delphi analysis through the following: (1) the identification of factors that contribute to the implementation of theses (the present strengths) with the method described below - weak signals; (2) the identification of barriers to the implementation of theses (the present weakness), and (3) determine the impact of the implementation of the thesis as future opportunities and threats.

According to E. Cornish, J. and S. Petersen Mendonçi, wild cards can be predicted by symptoms of changes, referred to as “weak signals” [6], which, in this methodology, should be analysed in the context of factors that favour the Delphi thesis. Weak signals, which is based on real data (described in science, arts, technology, media, etc.), are early, vague signs of impending major events, changes that will affect the system in a strictly indefinite future trajectory of development [9]. Weak signals are in the form of information, which deals with new ideas, innovation, or ways of thinking [25]. P. Masse claimed that these are small signs from today's point of view, but they are huge in translating the potential consequences [14]. In the context of the emergence of new technological paradigms (which is undoubtedly IoE), L. Ilmola and O. Kuusi emphasize the role of mentality filter (through which all weak signals, next to surveillance filter and power filter), which usually consist of analysing images of the future shape of the phenomenon [11].

3. The use of innovative methods in the area of IoE

Here comes the new revolutionary era of the Internet – “The Internet of Everything (IoE)” – giving rise to the largest transformation in the industry decades with the potential of nearly \$ 20 trillion. Today more and more objects communicate directly with each other (mainly in industry, energy and automotive), creating the Internet of Things (IoT), where machines, sensors and other devices exchange information without human intervention. IoT is just one of the elements of the IoE next to people, processes, and data supporting the mobile revolution, Big Data [2], cloud computing [23], or fog computing [22].

IoE functionality relates to the four main pillars of this [3, 15]: (1) in the area of people: the connection between individuals in a more appropriate useful manner; (2) in the area of processes: delivering the right information to the right person (or device) in a timely manner; (3) in the area of data: using data to obtain useful information for decision making; and, (4) in the area of things: mutual identification, communication and interaction between the physical devices connected to the Internet and each other in order to make intelligent decisions.

The revolutionary approach and the high complexity and dynamics of the IoE phenomenon influence the occurrence of a high level of uncertainty in areas such as technology, economics, society, legislation, environment, and ethics. These are the areas to which the IoE will be interdependent [2] (Figure 2).

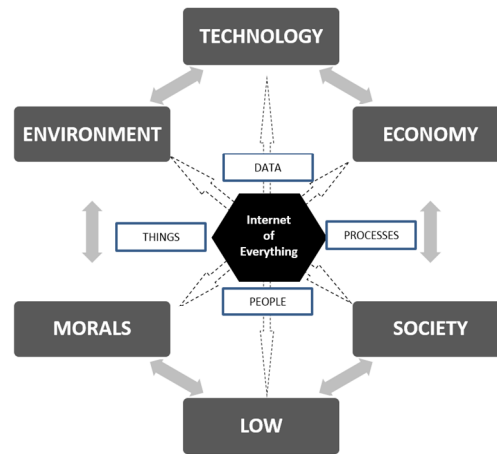


Fig. 2. Interaction of the main areas of the IoE ecosystem
Source: Author.

Examples of potential phenomena influence the growth of uncertainty in the IoE as follows [4, 8, 22]:

- Privacy and security, e.g., easy localization of every man;
- The security of contactless, distance, proximity transactions; and,
- The threat of skimming (illegally copying the contents of the magnetic strip/RFID tag of payment card without the knowledge of the holder), sniffing (eavesdropping to what is circulating in the network, and what is not addressed to us), spoofing (attacks on the computer system which consists of impersonating another element of the system), and jamming signals, e.g. RFID;
- The level of freedom, standardization of IoE;
- The level of technical/architectural heterogeneity IoE; and,
- The problem of the number of elements connected to the network (it is forecasted that, by 2020, the number of smart objects connected to the network will exceed 50 billion), affecting the limits of the possible use by, for example, cloud computing.

IoE is at a very early stage of development. In the author's opinion, this is the best time to prepare for anticipating unexpected changes in the future, which, from today's point of view, are burdened with a high level of uncertainty. One such tool could be a method for the identification and analysis of wild cards, presented in this publication.

Below are example performance analyses and the identification of wild cards in the IoE in social and technological areas. The works of selected students of logistics at Bialystok University of Technology was the inspiration, as the part of the course “Technology Foresight” (Table 1).

Table 1. Analysis of selected wild cards in the IoE based on an innovative methodology

RESEARCH METHOD	OUTPUT – DESCRIPTION
STEEPVL social factors	1) the level of mutual trust; 2) the level of awareness on IoE education; 3) ways of mutual information
DELPHI/ WILD CARDS	The development of cognitive science and possibility of technological interference in the human brain, affect the creation of sensors enable mutual transfer people thoughts and control remote devices through thought
SWOT/ WEAK SIGNALS factors supporting the realization of theses	STRENGTH: Young people are eager to use things that improve their daily lives; WEAK SIGNALS [29, 31, 33]: 1) Developing technology of BCI (brain-computer interface); 2) Cooperation Samsung with the University of Texas at Dallas to create a system for controlling the gadgets of Samsung by thoughts; 3) SEMG technology – prosthetic hand controlled by thought
SWOT barriers for the implementation of theses	WEAKNESS: The concerns of older people regarding new technology.
SWOT impact of the theses	OPPORTUNITY: Improvement of the Internet of Everything; THREAT: Possibility of easier surveillance
STEEPVL technological factors	1) the level of security of transport systems; 2) technical and technological possibilities of courier companies; 3) the condition of innovative urban logistics
DELPHI/ WILD CARDS	More frequent problems in urban transport, especially in large urban areas will cause the main means of transporting goods and people will be drones communicating with each other
SWOT/ WEAK SIGNALS factors supporting the realization of theses	STRENGTH: continuous exploration and development innovative solutions WEAK SIGNALS [28, 30, 32]: 1) DHL Paketkopter – shipment of drugs for a distance 12 km from Norddeich to the Island of Juist in Germany; 2) Amazon Prime Air – the delivery of small-size packages by drones; 3) EHang 184 – model of single drones for people
SWOT barriers for the implementation of theses	WEAKNESS: poorly developed urban infrastructure relating to innovative solutions
SWOT impact of the theses	OPPORTUNITY: improving the communication system in cities THREAT: negative impact on the ornithological environment

Source: Own design.

Due to the limited volume, this publication presents the results of only two areas of STEEPVL analysis, limited only to exchange (without the detailed characteristics) of several factors. In the above analysis, in spite of selectivity, it

is appreciated that the proposed solution is comprehensive and greatly influences the balance effect between the objective and subjective approach.

4. Conclusions

People increasingly need the knowledge and tools for the early detection of events and trends that may affect the process of shaping the future of science, technology, and innovation [18].

In a world where many phenomena occur constantly and dynamically, many of them, as described in this article IoE system, are violent and radical. To cope with the current socio-economic challenges, we should seek ways to minimize the uncertainty effect accompanying to these phenomena [13]. With the above knowledge, it is possible to minimize adverse events.

In the author's opinion, in the study of the uncertainty phenomenon (especially in the process of its levelling) such a complex system as IoE can play a key role in the multidirectional analysis of unprecedented events. One of such method can be innovative methodology for the identification and analysis of wild cards. Its advantages are high multidirectional analysis and a higher than usual degree of balance between the subjective and objective recognition.

Presumably, in the minds of many people, the idea of the IoE is a wild card. Despite the fact that the analysis of wild cards is a relatively difficult issue for both policy makers and researchers, it should be the subject of multi-ways analysis.

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Metodyka analizy dzikich kart dla zjawisk złożonych – przykład Internetu wszechrzeczy¹

Słowa kluczowe

Dzikie karty, niepewność, Internet Wszechrzeczy, badania przyszłości.

Streszczenie

Głównym celem artykułu jest charakterystyka nowatorskiej metodyki identyfikacji i analizy dzikich kart, wykorzystującej wybrany, ugruntowany dorobek metodyczny badań przyszłości – a w szczególności metody delfickiej, analizy SWOT, analizy STEEPVL oraz słabych sygnałów. Nowatorstwo ujęcia na

¹ The research were conducted within S/WZ/1/2014 project and were financed from Ministry of Science and Higher Education funds.

minimalizacji efektu subiektywizmu przy jednoczesnym kompleksowym (zbliżonym do holistycznego) ujęciu badanego zjawiska. W opinii autora poprzez implementację elementów wyżej wymienionych podejść badawczych do metody analizy zdarzeń bezprecedensowych możliwe jest spopularyzowanie metody dzikich kart, zwłaszcza w polskim (europejskim) środowisku badawczym. Celem dodatkowym jest charakterystyka praktycznego zastosowania nowej metody poprzez analizę złożonego rozwojowego zjawiska, jakim jest Internet Wszechrzeczy. Złożoność ta wpływa na występowanie bardzo wielu obszarów niepewności. W opinii autora zastosowanie kompleksowych analiz obszarów, których rozwój obciążony jest dużą dozą niepewności, pomoże to zjawisko (niepewności) zminimalizować poprzez przygotowanie się do trudno przewidywalnych zmian.