

IDENTIFICATION A PRIORI OF WILD CARDS IN THE CONTEXT OF UNCERTAIN EVENTS IN THE MODERN LOGISTICS

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Abstract: The aim of the article is theoretical characterization of wild cards as future surprising events from today's point of view difficult to anticipate, with a low probability of joining, a significant, negative or positive impact. There have been done the definitional analysis with examples and characterized wide range of conceptual substitutes. In addition, it was done and shown a real analysis of the wild cards in practical terms in selected areas of modern logistics, such as: 3D printing, augmented reality, Big Data, cloud logistics, Internet of Things, robotics & automation, self-driving vehicles, as drivers of the fourth industrial revolution. The implementation of these concepts requires appropriate tools of cooperation between the all parties, a new way of joining and merging of systems such as: manufacturing, shipping, transport, logistics, sales channels, service, etc. These phenomena are so new and complex, and therefore uncertain that require in-depth prospective analysis. One of them may be the identification and analysis of potential wild cards.

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1. INTRODUCTION

In one variation of the card game "poker", in the waist is a joker (wildcard), which gives the player drawing a favourable opportunity to give it a titter of any card. But also this creates an unfavourable situation for the rest of the players (Barber, 2006).

"Jokers" in future research (especially in foresight), in studies of risks and uncertainties are described most often as a wild card. They can also specified by other appellations, as shown later in this article. In general, it should be stated that the wild cards are future events from today's point of view difficult to anticipate, surprisingly, with a low probability of joining, sudden, hard to prepare for it, having a significant impact (negative or positive) for specific groups of people (Hiltunen, 2013).

The scope of the impact of wild cards is infinitely wide, affecting many other events, which is why they should not be ignored. It is vital to have basic and practical knowledge, which can be useful, especially in an environment exposed to exceptional or emergency events (Mendonca, Cunha, Kaivo-oja & Ruff, 2004; Mendonca, Cunha, Ruff & Kaivo-oja, 2009). This seems to be especially important in the case of new events, burdened with a high degree of uncertainty, in the forward-looking context. Such phenomena include the latest trends in logistics, e.g.: 3D printing, augmented reality, Big Data, cloud logistics, Internet of Things, robotics & automation, self-driving vehicles as one of the main areas of the fourth industrial revolution.

It is predicted that "Industry 4. Generation" will cause the growth of production automation. It consists of communication devices with each other, in case to product goods adjusted to users' individual preferences. These changes in the context of the nearest decade should adopt a global character (Stasiuk-Piekarska & Wyrwicka, 2015). The aim of the fourth industrial revolution is to create intelligent enterprises with the so-called area of "Industry 4.0", characterized by adaptability, efficiency of resource use, ergonomics, the ability to optimizing complex logistics processes (for example to Cloud Supply Chains) (Grzybowska, Kovács & Lénárt, 2014). The ability of these types of companies to cope with uncertainty and rapid adaptation to a significant, and sometimes sudden change becomes a key factor of success, becoming the major challenge for the management (Halicka, 2016). These phenomena are so new and complex, and therefore uncertain, that require depth and prospective studies. One of them can be the identification and analysis of potential wild cards.

2. DEFINITIONAL ANALYSIS OF WILD CARDS

In 1992, the Copenhagen Institute for Futures Studies (CIFS), BIPE Conseil (Issy- Les- Moulinaux) and Institute for the Future (Menlo Park, Kalifornia) was

proposed in a joint publication the definition of wild cards: „A wild card is a future development or event with a relatively low probability of occurrence but a likely high impact on the conduct of business”. According to K. Steinmüller if the future, is a space of human hopes and fears, desires and plans, or expectations, wild cards are absorbers of that space (Steinmüller, 2004).

According to J. Petersen wild cards are characterized by the following features (Barber, 2006):

- have a direct impact on human life;
- have a broad, important and sometimes fundamental, high impact;
- moving too fast for the analysed system that can be adjusted to the shock, which can cause.

Analysis of wild cards may be helpful in the construction of scenarios to explore their (scenarios) stability and susceptibility to interference of interfering external or internal factors. The basic principle for future studies should not be dependent on what is logical convincing, but rather to take into account the non-intuitive behaviour of the system. It is possible, taking into account in analysing the future potentiality exactly appearance of wild cards (Steinmüller, 2004).

Wild cards can fulfil several functions in the process of scenario development (Steinmüller, 2004):

- can be used to estimate the scenario sensitivity to external interference;
- can be used to compensate for any weaknesses;
- can help identify alternative of scenario and be open with regard to unexpected changes;
- they can be used to counteract some common errors – such as lack of imagination, the dominance of wishful thinking and support for catastrophic scenarios.

According to O. Markley for efficient identification of potential disruptive events, especially in very unstable environments, wild cards can be divided into four types:

- Type I: low probability, high impact, high credibility
- Type II: high probability, high impact, low credibility
- Type III: high probability, high impact, disputed credibility
- Type IV: high probability, high impact, high credibility.

Some wild cards depending on knowledge can evolve between different types. An interesting example, referring to the hypothesis of global warming explores O. Markley in his work.

Wild cards may have different scope of impact (Fig. 1). According to M. Barber, they depend on the different perspectives of perception of reality. These include perspectives: personal, local, national, transnational, international and global (Barber, 2006).

Some wild cards are essential for large scale (e.g. a meteorite strike leading to the extinction of some species of plants and animals), while others are unique in

microscale (e.g. for a single company, an accident in a factory or a crisis of reputation that could lead to bankruptcy). Wild cards can also be local in nature but having universal significance (for a global industry or scientific knowledge), as in the case of the world's first commercial jet airliner De Havilland Comet. Shortly after the start of this service there has been a series of disasters in the years 1953–1954, due to faulty design pressurized cabin and a full appreciation of fatigue – the phenomenon little known so far. Wild cards are thus both an important component of the process of change and as part of the process of interpreting the world (Mendonca, Cunha, Ruff & Kaivo-oja, 2009).

scope of impact	Global	Member of the ISIS became President of USA	Establishment of the university that employs only the Nobel Prize winners	Introduction to the country such China ban on the use of coal	Failure of communication satellites	Turn off the Internet	Collision with a large asteroid
	International	Embargo on imports of food and energy	Creation of the freetax zone between South and North Korea	Unification of South Korea and North Korea	UNO becomes strictly commercial organization	World War the III	Does not meet the country's foreign debt
	Transnational	No food	Creation of the municipality/land of the residents who are only refugees	International trade sanctions	Unexpected wars among neighboring countries	Terrorism directed mainly towards Western countries	Appointment of new military organization uniting countries outside NATO
	National	Prezident of Iran is American	Collapse of telecommunications systems	Poisoning considerable resources of fresh water	Poisoning exported/imported meat	Termination of international hostility	Greater tendency to detonate nuclear weapons
	Local	Shootings in schools	Large chemical disaster	Natural disaster	Head of the new organization trasnational in one municipality	Management of international trade route from one city	City such Bialystok becomes the world "giant" in the field of nanotechnology
	Personal	Winning a lottery	Opening of a new factory by a major global corporation	Natural disaster	New epidemic	Disease epidemic	No food
		Personal	Local	National	Transnational	International	Global
		scope of impact					

Fig. 1. The scope of impact of wild cards – point of view for the western world; own work based on (Barber, 2006)

Wild cards are often preceded by weak signals, which are incomplete and fragmentary early data, imprecise signs of impending major events, changes that will affect trajectory of development of the system in a strictly indefinite future (Magruk, 2010). Helpful in the identification of the wild card is their combination with other methods of research such as: scenario, desk research, STEEPVL.

3. CHARACTERISTICS OF CONCEPTUAL SUBSTITUTES OF WILD CARDS

Depending on the research contexts synonymous terms for "wild card" in the literature are:

- bifurcations,
- black swans,
- discontinuities,
- unexpected events, surprises,
- unprecedented future events,
- turbulence – strategic turning points,
- tsunami of change,
- rare event,
- STEEP surprises,
- accidental events,
- irregular progress (fluctuating).

According to I. Prigogine analogy to the wild card is the phenomenon of bifurcation. Bifurcations appear as peculiar points where the trajectory of the examined system divided into "new embranchments" (e.g. as at the rivers). The establishment of all branches is possible, but only one of them will be fully exploited (Petersen, 2008). Nassib Taleb refers to a black swan as an phenomenon with the following three attributes: 1) firstly, it is an outlier, as it lies outside the realm of regular expectations; 2) secondly, it carries an extreme impact; 3) thirdly, despite its outlier status, human nature makes us concoct explanations for its occurrence after the fact, making it explainable and predictable, so it has a feature of retrospective predictability (Aven, 2015; Kononiuk & Magruk, 2015).

According to G. Burt man is very often surprised by different disruptions and discontinuities (at different levels, from the subjective to global). With disruption generally are associated words such as: commotion, interruption and disturbance. Disruptions does not affect the substantial changes and therefore should not be treated as a substitute for wild cards. But as a wild card we should treat the discontinuity as a more permanent and irrevocable, meaning major changes. With discontinuity generally are associated words such as: intermittent, unpredictable and irregular (Burt, 2007).

Unprecedented future events could cause deviation from the original forecast surprise-free if they were to occur (Agami, Omran, Saleh & El-Shishiny, 2008).

Turbulence is a type of wild cards, which should be inextricably linked to the strategic actions in the company which applies the principle of chaos management. Turbulence is not predictable, but some of them can be detected early and monitor in orders to take strategic actions (Kotler & Caslione, 2009).

According to J. Dator the tsunami of change is a wild card which growth is very large, sudden and widespread, but little can be done to change it or stop it. The

tsunami of change are events affecting at the same time a lot of people. It represent significant changes to existing approaches creating new paradigms at the same time (Barber, 2006).

STEEP surprise is a type of wild card, defined as having a high probability and high impact as seen by experts if present trends continue, but low credibility for non-expert stakeholders of importance.

Referring to the model of the development of science, the irregular progress (fluctuating) refers to the claim that the tempo of development of knowledge is disturbed by extraordinary events. But it does not change the general character of the model. This scheme is not located at the final time point (Szynkiewicz, 2009).

With the fluctuating corresponds the view of M. Heller about accidental events, according to which in science nothing is certain. History shows that even the most reliable theories may be subject to revision (Heller, 2012). A perfect example is the field of physics. Albert Einstein is the author of a wild card under the name of the general theory of relativity. It was introduced in 1915 as a new understanding of time and space revolutionizing existing, Newtonian view of the world (Hawking, 1990).

4. WILD CARDS IN THE FIELD OF THE FUTURE DEVELOPMENT OF LOGISTICS

The results of the research presented in this chapter use the assumptions proposed by K. Steinmüller. According to this author the analysis of the wild cards should consider the following aspects (Steinmüller, 2004):

- Subject: the topic of wild cards: the sector from which it's come, or to which will have a direct impact (e.g. technology, politics, etc.).
- Impact: minimal consequences in examined scenario vs. creation of a completely new scenario. Such differentiation between strong and weak wild cards is possible only after the analysis of the consequences of the actual scenario.
- Reliability: some wild cards are reliable – fit the worldview investigating. Other wild cards are not reliable – are at odds with intuition and common sense, but they are not absolutely impossible. So some wild cards are unlikely, others are very unlikely, and some are improbable (depending on the subjective assessment);
- Time scale: it should be distinguished wild cards, which are sudden events, unique events of incredible processes: short, medium and long term;
- Causes: we can distinguish between wild cards, which occur without any preparation to them - are the result of a random confluence of circumstances and wild cards, which are the result of long-term processes.

The inspiration for the analysis are results of 2016 DHL Trend Research that relate to identified the latest technological, social and economic trends in the logis-

tics industry. On the one hand they can be regarded as a kind of development scenarios, on the other hand, as research subject. Recent trends relate to the following areas: anticipatory logistics, batch size one, convenience logistics, de-stressing the supply chain, fair & responsible logistics, gray power logistics, logistics market-places, multi-purpose networks, omni-channel logistics, on-demand delivery, shareconomy logistics, smart energy logistics, supergrid logistics, tube logistics, 3D printing, augmented reality, big data, bionic enhancement, cloud logistics, digital identifiers, Internet of Things, low-cost sensor technology, robotics & automation, self-driving vehicles, self-learning systems, unmanned aerial vehicles. The DHL studies used the following data sources: analysis of megatrends, analysis of mikrotrends and business startups, interviews with experts and scientific partners, needs analysis of customers (Heutger & Kückelhaus, 2016).

Sometimes mistakenly, wild cards, and trends are treated as synonyms. According to O. Saritas and J.E. Smith we should always distinguish them (Saritas & Smith, 2011).

In the analysis, the wild card very important is research context. In this article, the context of the research is the development of modern logistics, with particular emphasis on Industry 4.0.

Table 1. Hypothetical wild cards for selected logistics trends in the context of the uncertain; own work based on (Heutger & Kückelhaus, 2016)

Subject	Areas of uncertainty	Hypothetical wild card	Degree of reliability	Time scale	Causes
3D PRINTING	1. Restrictions on materials; 2. Liability in the event of faulty 3D printed products	Complete replacement of conventional production technologies by 3D and 4D printers	0	>5	3D Printing on the Fly from Amazon
AUGMENTED REALITY	1. Requirements of new standards and interfaces; 2. The robustness and reliability of AR devices	The establishment of government institutions dealing with augmented reality	1	>5	New Standard of Order Picking at DHL
BIG DATA	1. Privacy concerns regarding data collection and protection; 2. Data transparency and access	The elimination of human involvement in the decision-making process for logistics information systems based on artificial intelligence and big data	0	>5	LogiNext - A big data analytics platform increasing route optimization
CLOUD LOGISTICS	1. Data migration and security issues; 2. Performance concerns such as latency triggered by real-time requirements	Total virtualization of data (including sensitive) used in the process of logistics management	0	>5	Transporeon - Cloud Logistics Services
INTERNET OF THINGS	1. Lack of logistics IoT standard 2. Data and security issues in the IoT-powered supply chain	"Management" of Internet by things	1	>5	Agheera - The IoT Platform for Logistics
ROBOTICS & AUTOMATION	1. Legal restrictions on the use of robots near human workers; 2. Appropriate level of automation vs. human job security	"Rebellion" of robots	1	>5	Sawyer - one-armed collaborative robot
SELF-DRIVING VEHICLES	1. Existing legal restrictions; 2. Social acceptance by workers and the public	In logistics companies driver-man is completely replaced by self-driving vehicles	1	>5	Starship Technologies - autonomous Parcel Delivery with

Each element of analysis (Tab. 1) refers to the following items proposed by K. Steinmüller:

- Subject – logistics trend;
- Impact – for the moment is not possible to determine;
- Reliability: measured in three-point scale: unlikely – 2, very unlikely – 1, improbable – 0
- Time scale: sudden event: 1, the process of short-term shorter than 5 years: <5; process longer than five years: > 5.
- Reasons: in each case are the result of a process or event currently existing in the logistics environment.

According to the author of this publication, element enriching and facilitating the identification of wild cards is a defined areas of uncertainty for each of the subjects (Tab. 1). Due to the limited capacity of the article list of topics was reduced to: 3D printing, augmented reality, Big Data, cloud logistics, Internet of Things, robotics & automation, self-driving vehicles These areas closely correspond to the technological aspect of the fourth industrial revolution. Added by the author the uncertainty areas have been identified on the basis to the trend challenges (defined by DHL).

6. CONCLUSIONS

In the industry is running out easy methods to ensure the effectiveness of the enterprise. Industrial production in countries such as Germany, China, USA, is increasingly driven by the development of new technologies, including cyber-physical systems, big data, cloud computing, Internet of Things. This phenomenon has received the name of Industry 4.0 (Turczyński, 2016).

Each subjects analysed in this article will directly impact on the Industry 4.0 in the area of logistics, in its various phases and ranges. These phenomena are so new and so complex that they require in-depth prospective analysis. The author has shown that one of them can be undoubtedly identification and analysis of potential wild cards.

The latest trends in the logistics industry according to DHL research indicate that many solutions covering the sphere of technological, social and economic is currently at a very high level of advancement and development's dynamics. In connection with this state of affairs identification of wild cards, with any O. Markley's type was difficult. This resulted in a situation that it was easier to create a new type of wild cards with low probability, high-impact, low credibility and long-term time scale.

REFERENCES

- Agami N.M.E., Omran A.M.A., Saleh M.M. & El-Shishiny H. (2008), An enhanced approach for trend impact analysis. *Technological Forecasting and Social Change*, 75, pp. 1439–1450.
- Aven T. (2015) Implications of black swans to the foundations and practice of risk assessment and management. *Reliability Engineering and System Safety* 134, pp. 83–91.
- Barber M. (2006) Wildcards – Signals from a Future Near You. *Journal of Futures Studies* August, 11(1): pp. 75–94.
- Burt G. (2007) Why are we surprised at surprises? Integrating disruption theory and system analysis with the scenario methodology to help identify disruptions and discontinuities. *Technological Forecasting and Social Change* 74, pp. 731–749.
- Grzybowska K., Kovács G. & Lénárt B. (2014), The supply chain in cloud computing, *Research in Logistics & Production* Vol. 4, No. 1, pp. 33–44.
- Halicka K. (2016), Innovative classification of methods of the Future-oriented Technology Analysis. *Technological and Economic Development of Economy* 22(4), pp. 574–597.
- Hawking S.W. (1990), *Krótką historia czasu. Od wielkiego wybuchu do czarnych dziur*, Wyd. Zysk i S-ka, Poznań.
- Heller M. (2012), *Filozofia przypadku*, Copernicus Center Press.
- Heutger M. & Kückelhaus M. (2016), *Logistics Trend Radar. Delivering insight today. Creating value tomorrow! Version 2016*, DHL Customer Solutions & Innovation, Troisdorf, Germany.
- Hiltunen E. (2013), *Foresight and Innovation: How Companies are Coping with the Future*, Publisher: Palgrave Macmillan.
- Kononiuk A. & Magruk A. (2015), Wild cards in Polish foresight practice. *Procedia – Social and Behavioral Sciences* 213, pp. 951–956.
- Kotler P. & Caslione J.A. (2009), *Chaos: zarządzanie i marketing w erze turbulencji*, MT Biznes, Warszawa.
- Magruk A. (2010), Słabe sygnały i dzikie karty – innowacyjne metody antycypacyjne. *Ekonomia i Zarządzanie* T.2, no. 4, pp. 126–136.
- Mendonca S., Cunha M.P., Kaivo-oja J. & Ruff F. (2004), Wild cards, weak signals and organisational improvisation. *Futures* 36, pp. 201–218.
- Mendonca S., Cunha M.P., Ruff F. & Kaivo-oja J. (2009), *Venturing into the Wilderness Preparing for Wild Cards in the Civil Aircraft and Asset-Management Industries*. *Long Range Planning*, 42, pp. 23–41.
- Petersen J.L. (2008), *What they are and how they work*, presentation at Wild Card Workshop, The Arlington Institute.
- Saritas O. & Smith J. E. (2011), The Big Picture – trends, drivers, wild cards, discontinuities and weak signals. *Futures* 43, pp. 292–312.
- Stasiuk-Piekarska K. & Wyrwicka M.K. (2015), Organising – still an important function of production management. *Research in Logistics & Production* Vol. 5, No. 2, pp. 129–142.
- Steinmüller K. (2004), The future as Wild Card. A short introduction to a new concept, Ed. S. Brockett and M. Dahlström *Spatial Development Trends Nordic Countries in a European Context*, Nordregio, Stockholm, pp. 193–202.

Szynkiewicz M. (2009), *Teorie ostateczne w naukach przyrodniczych. Studium metodologiczne*, Wydawnictwo Naukowe Wydziału Nauk Społecznych Uniwersytetu im. Adama Mickiewicza w Poznaniu, Poznań.

Turczyński M. (2016), materiały prasowe firmy doradczej Deloitte zamieszczone na stronie <http://www2.deloitte.com/>, Warszawa, 18 kwietnia.