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Mapping the maturity of SMART WORLD trends as a tool for developing business excellence and reducing organizational complexity

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Abstract. *By highlighting the importance of tracking the maturity of various phenomena, this study aims at facilitating their response to the emerging changes and reducing the complexity of organizational management processes. To support business excellence and organization management in the SMART WORLD era, special attention was paid to previous findings. The pilot study research was carried out on a sample of 107 enterprises from Poland and Lithuania. The results of the data analysis collected during the quantitative research and their mapping identified: currently leading trends (mainstream - "new normal trends"), trends expected to undergo the development in short/medium/long term perspective and trends labelled as "no future" - fads or one step before their time. Research results were the basis for expressing preliminary conclusions about how to reduce uncertainty and complexity of the process of strategic decision making by contemporary managers.*

Keywords: smart world, complexity, business excellence, maturity of trends, knowledge mapping.

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Introduction

Along with the successive technological revolutions and their associated socio-economic, environmental, cultural and communication breakthroughs, a new reality is developing: the so-called "SMART WORLD" organizations (Kosta, et al., 2018; Zhu, et al., 2015). This is

featured by unprecedented opportunities, but also requirements, needs and challenges. Many of them are socially and environmentally highly appreciated; at the same time, given their novelty or complexity, others are one step ahead of the current needs and knowledge, thus being difficult for the society and business practitioners to properly decipher them. Consequently, they arouse resistance, generating errors in use and decreased reliability of their assessment. Simultaneously, there are also "missed" phenomena and solutions, superfluous, hindering everyday activities, or in the long run, harmful to the society or the environment. These trigger a higher complexity of organization management processes, especially of the business excellence in the SMART WORLD era frame (Rawashdeh, et al., 2019; Liang, et al., 2016; Lom, Pribyl, & Svitek, 2016).

Therefore, the need for tracking and mapping the world around us is growing. Despite of a cornucopia of tools used at analyzing the environment, too often business practitioners still lack clear, reliable, systematic and up-to-date information to support decision-making processes. The abundance of information overwhelms them, generates mental chaos, concerns, and challenges (Ahmed, Khan, 2017). Moreover, the pace of subsequent required changes increases the complexity of management of the SMART WORLD (Liu, et al., 2019) era's organizations. This causes a research gap in the conscious ordering of knowledge in this field and the clear assessment of its usefulness for various management situations.

Hence the formulation of the research question and the four assumptions. Therefore, the aim of the study is highlighting the importance of tracking the maturity of trends (Amosha, Pidorycheva, & Zemliankin, 2021) affecting business related processes. Secondly, we pursue the emphasis of the above-mapping importance in responding to the emerging changes, and reducing the complexity of organizational management processes in service in the SMART WORLD era.

Special attention was paid to previous findings of both scientists and business practitioners (Manesh, et al., 2020) related to the technological, social, economic, environmental and communication trends and their associated management concepts. The research was carried out on a sample of 107 enterprises from Poland and Lithuania. The level of market maturity, and the implementation and strategic impact of the chosen emerging trends on the surveyed enterprises and their belonging industries were considered. The results of the data analysis depict and map the current leading trends (mainstream), short / medium / long term trends and "no future" trends. Conclusions and recommendations were formulated on how the complexity of the strategic decision making could be reduced.

Literature review

Complexity and Business excellence in the SMART WORLD

To set the essence of the key phenomenon for the development of the organizations in the era of SMART WORLD, a systematic review of the literature was performed on *complexity* and *business excellence* keywords. The aim was to check whether they belong or not to the popular and currently in-use research trends. Moreover, we aimed to identify some related terms and issues.

For the bibliographic map on *complexity*, we used the resources of the Web of Science Core Collection database and the VoS Viewer software. There were applied restrictions such as the keyword "complexity" (contained by the title of the journal, conference, and book chapter), the publishing year (set between 2011 and 2021), and the belongingness to at least

one of the following WoS CC categories: Management, Business, Economics, Operations Research Management Science. This resulted into 1708 items graphically depicted by the figure 1 below. Based on it, we conclude that "complexity" has been a recurrent topic for the last 10 years, definitely drawing attention and triggering interesting and relevant analysis.

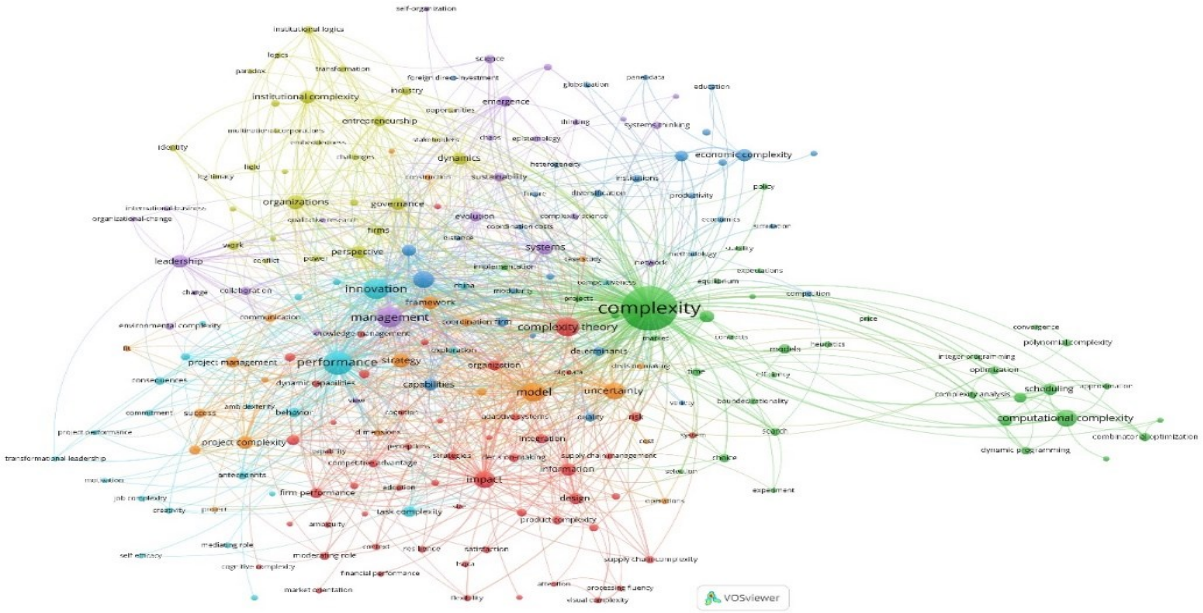

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Figure 1. "Complexity" keyword co-occurrence map

Source: Own elaboration.

The above-introduced Figure 1 maps the co-occurrence of the keyword *complexity*. It displays the correlation set between it and some other associated keywords, such as *performance, management, organizations, innovation, impact, complexity theory, leadership, dynamics, entrepreneurship, economic complexity, systems*. The ball size is given by the number of each keyword occurrences. The analysis of the map reveals the existence of 7 clusters, each of them picturing a manifold and entangled network of connections, and interdisciplinary and multi-context issues. This is a sign of the growing number of socio-economic phenomena we are facing nowadays, as well as a warning on the potential hinder exerted by them on the business processes. The more complex the environment, the more difficult is for a company to achieve business excellence. To skip this, things must be understood, and patterns should be recognized and systematized.

Complexity is a concept historically embedded into the theory of (complex) organizations (Cunha and Rego, 2010). According to McGarvey and Hannon (2004), the world itself is made up of a multitude of complex systems, starting with our own bodies and ending with the ecosystems and economic systems that function by common structural and functional characteristics. According to Heylighen et al. (2007), this complexity is shaping up to be the essential feature of contemporary society. On the one hand, this is triggered by the awareness of the lived reality, on the other hand, by the active role we assume every day in the process of creating and developing this world. According to Ghinea, Mihaylova and

Papazov (2015), by supporting the technological advancement we facilitate transport, communication, information, and as they become more effective or grow, human, organizational, and cultural interaction is exacerbated. The result is a system of complex systems. Consequently, complexity came to be taken for granted as a necessary condition for the proper organizational functioning in the sense that only complex organizations can tackle complex problems. Far from being true, this unfolds a reverse reality as complexity frequently leads to labyrinthine business models, difficult to adapt, and more or less immune to change. On the other hand, if the change does occur, the variation of one part of the complex system triggers the change of another one, this way the change becoming propagated in an unpredictable and / or uncontrollable manner sometimes (see also the butterfly effect, Cvitanovic et al., 2012). Organizational systems are complex in a technical sense. In general, the meaning assigned to the term *complex* is *complicated*. However, the technical meaning of complexity does not refer to how complicated organizations are, but to the type of interaction that occurs between the different elements: a high degree of systemic interdependence and, implicitly, non-linearity (Hazy et al., 2007). Therefore, complex behavior occurs as a result of the inter-relationship, interaction and interconnectivity of the elements within the system, but also between the system and its environment (Mitleton-Kelly, 2003; Daryani & Amini, 2016). As a counterpoint, there is also issued the theory according to which *complexity arises from simplicity*.

Nevertheless, it seems to be easier recognizing than defining complexity (Lukosevicius, Marchisotti & Soares, 2016), as people genuinely have an intuitive understanding of complexity, that doesn't fit every time the more elaborated dictionary definition. In 2017, San Cristóbal reviewed the definitions given to *complexity* and summarized as some of the most relevant ones the following: a. complexity as consisting of many varied interrelated parts; b. complexity consisting of interdependencies among the product and process technologies, novelty and difficulty of goals; c. complexity as a property of the system that makes it difficult to understand; d. complexity as information inadequacy when too many variables interact.

As a result of the regular and / or random interactions and transformations within the system (the manifestation of synergy property), certain novelty elements occur such as the higher-level structures, new stereotypes and / or dynamics, complex causalities (Goldstein, 2005). This is the complex systems feature called emergence, and it represents the very result of the multiple dynamics manifested at the level of the structure of the respective system, in this case, of the synergy manifested within it. Thus, complexity affects modelling, evaluation, and control of projects and the objectives of time, cost, quality and safety, and not at least, complexity can also affect the choice of the appropriate organization form, including the project managers experience required (San Cristóbal, 2017). All these are amplified SMART WORLD specific features. Each and every side and character of modern organizations impact their Business Excellence in a particular way (Jankalova & Jankal, 2020; Aras & Crowther, 2010; Bauer, Falshaw, & Oakland, 2005). Thus, for a better understanding of *business excellence*, a second bibliographical map was performed. The same methodology was used, with the only change of keyword (*business excellence* instead of *complexity*). The resulted map displays 703 items (figure 2 below), a fact that leads to the conclusion that *business excellence* has been a highly studied topic for the last 10 years, even if to a lesser extent than *complexity*.

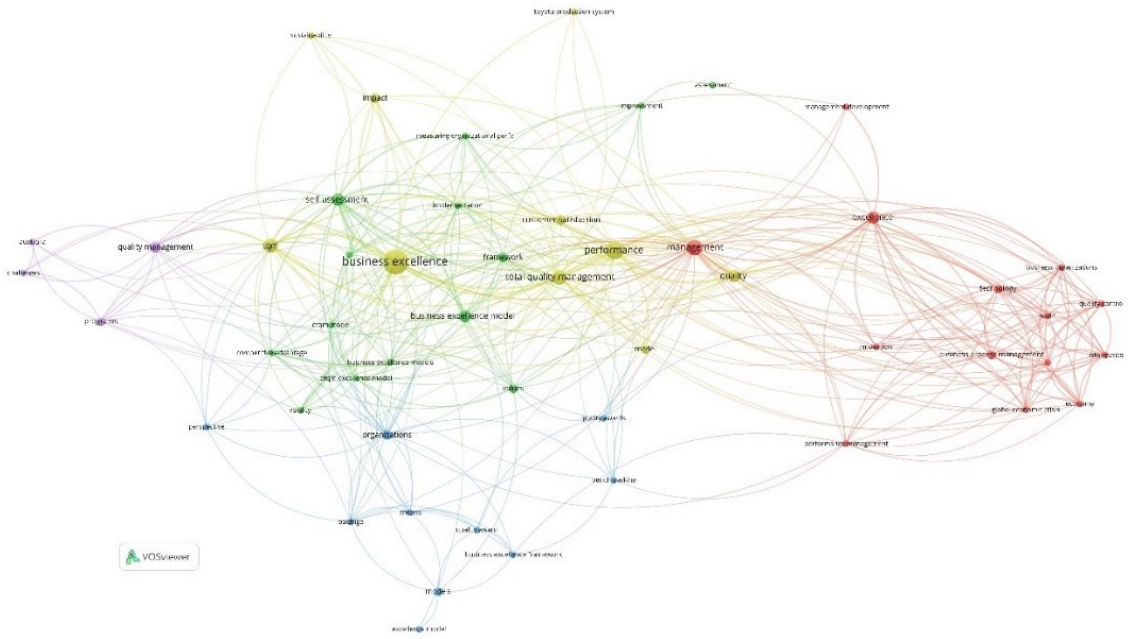

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Figure 2. "Business excellence" keyword co-occurrence map

Source: Own elaboration.

The co-occurrence map for the keyword *business excellence* displays 5 clusters and it is constructed on some other keywords such as: *performance, management, models, organizations, excellence, self-assessment, quality and quality management or TQM*.

Considered by some a simple „buzz word", raised by others to the rank of a company strategy underpinning its growth, *Business Excellence* is most frequently referred to as an integrated collection of practices aiming to develop and strengthen the management systems and processes, and help a business efficiently and successfully operate and become the best it could be (Mann, Mohammad, & Agustin, 2012). A quick browse throughout the research materials published shows a lack of consistency in defining Business Excellence (Dima, Clodnitchi, Istudor, Luchian, 2019). A consensus is still far away from being reached also because some scholars consider it an end in itself, while others do not (Bergant, 2021).

Irrespective of the size or type of business, private or public, Business Excellence consists in the continuous effort put by the organizational leadership and management in the key processes development that triggers the productivity increase, on the one hand, and customer satisfaction, on the other one. Or as in Kanji's perspective (2005), BE is triggered by the simultaneous satisfaction of all stakeholders. The concept of Business Excellence also works as an umbrella covering other popular practices aiming to increase an organization's efficiency, such as Just-in-time, Total Quality Management, Six Sigma, Business Continuous Improvement, Lean Thinking, etc. However, it proves its complexity by bringing together not only different topics of interests (Industry 4.0, Sustainable Development Goals, and Corporate Social Responsibility) (Mondejar, et. al., 2021) but also nations as there is a considerable number of countries and organizations, at the European level and beyond, sustaining the implementation of Business Excellence Models (https://efqm.org/; Zapletalova, 2022; Idris, 2019; Toma & Marinescu, 2018). According to Bali, Aggarwal &

Sharma (2021), not only that Business Excellence is facilitated throughout the application of Artificial Intelligence (Mhlanga, 2020), as the core of the Industry 4.0 (Gallo, et. al., 2021; Peres, et al., 2020), in marketing (Strach, 2018), operations & supply chain (Xu, 2022; Tortorella, et. al., 2021; Szombathelyi, Waldbuesser, & Tench, 2015), finance (Pazaitis, De Filippi, & Kostakis, 2017), and HR, but this integration of the cyberspace and physical space will smooth transition towards the Society 5.0 (de Hoyos Guevara, et. al., 2020; Minchev, 2020; Pena-Cabrera, Lomas, & Lefranc, 2019; Salimova, et. al., 2019) seen as the one maintaining the balance between the economic and social gain. This will no longer praise singularly the wealth creation, but the sustainable growth (Saniuk, Grabowska, & Gajdzik, 2020; Prause, & Atari, 2017; Quoquab, & Mohammad, 2016) as well, because the market-economics is depending on organizations' integrity, and their consideration of the environmental and social concerns (Kanji, 2005). Thus, Corporate Social Responsibility has also started to gain prominence, especially since 2004 when the European Foundation for Quality Management (EFQM) started to promote the European Business Excellence Model (Murthy, Sangwan, Narahari, 2021) as a powerful tool for integrating quality in organizations (Neergaard & Pedersen, 2014). According to Denis (2015), the most significant drivers of Business Excellence are the Criteria and Models of BE that support and drive change at personal, professional, organizational, national, and regional levels, around the world. These, in his opinion, will help us return to our roots and will build a healthier, wealthier, safer, and more sustainable world.

Among the BE models (BEM), it is worth mentioning that novel models, such as the EFQM 2020, adopt the strategic management lens in line with the Business Model concept, and are more flexible and less prescriptive. The novel BEMs aim to both presently deliver performance and facilitate transformation creating enduring value while responding to the challenges and opportunities of changing business environment and achieving remarkable results (Fonseca, 2021).

In a SMART WORLD, business excellence gains a new dimension. But the "SMART WORLD Business Excellence" is not only *Excellence 4.0*, based on Industry 4.0 technologies, (Fonseca, Amaral, & Oliveira, 2021; Martuswicz, Szewczyk, & Wierzbic, 2020; Carvalho, et al., 2019; Dombrowski, Wullbrandt, & Fochler, 2019; Ojra, 2019), or *Sustainable Excellence*, BE based on SDG, (Jankalova & Jankal, 2018; Adamek, 2018; Rocha-Lona, et al., 2015; Asif, et al., 2011; Vadari & Parandker, 2011), but also BE based on social responsibility, the so-called *CSR Business Excellence* (Jankalova & Vartiak, 2017; Caratas, 2014; Servaes, & Tamayo, 2013; Foote, Gaffney, & Evans, 2010).

The maturity level of socio-economic trends and organizational processes as a support for business excellence

Business Excellence has intrinsic and extrinsic enhancers: on the one hand, there is a strong connection between the maturity of each organization in terms of types of activities, processes and business-related activities (internal determinants), on the other hand, each organization external environment exerts a considerable influence on it (i.e. social behavior trends, the emerging of new technological or environmental solutions, ground-breaking theoretical concepts in various scientific disciplines, and not least, more and more dynamic socio-economic requirements and needs), these being external determinants.

Both categories of Business Excellence determinants are featured by different levels of maturity (Meza-Ruiz, et al., 2017; Albliwi, Antony, & Arshed, 2014; Van Looy, De Backer, &

Poels, 2011), the latter being driving factors for a potential market success. Their correlation and coherent integration amplify their effect. Thus, their monitoring, quantification and foreseen reaction becomes important.

Maturity as a measure of assessing an organization's ability against a specific feature has become popular since the Software Engineering Institute's (CMM) Model was proposed at Carnegie Mellon University (Paulk, et al., 1993a, b). Researchers correlated the amount of information held with the organization readiness, in terms of its resources (Steinlechner, et al., 2021), in the sense that more information leads to a wider scope, and to more mature and better coordinated activities.

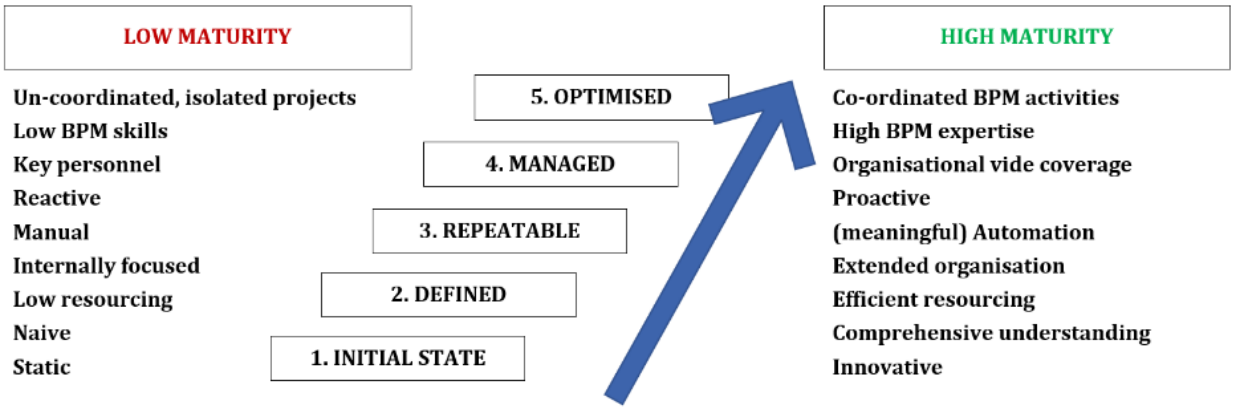


Figure 3. "Business excellence" keyword co-occurrence map

Source: de Bruin & Rosemann, 2005.

Among the researchers that studied the maturity phenomena, Maull et al. (2003) proposed a two dimensions model given by an objective measure (time, size of the team of implementers, etc.) and a weight of the readiness to change. Also, a bidimensional model was conceived by DeToro and McCabe (1997). Table 1 below shows some of the relevant approaches in this field.

Table 1. Dimensions of the BPMM model

DIMENSION	DEFINITION	ORIGIN	PURPOSE
FACTOR	A specific, measurable and independent element that reflects a fundamental and distinct characteristic of BPM. Each factor is further broken down in a 1-m hierarchy	Current factors have been derived from an extensive literature of BPM critical success factors and barriers to successful BPM implementations.	1. To cluster important components of BPM and allow a separate evaluation of these factors (i.e. enable identification of the organization strengths and weaknesses most likely to impact on BPM success). 2. To enable organizations tailoring specific BPM strategies, aiming to increase BPM success. 3. To enable future research of the BPM driving factors.

DIMENSION	DEFINITION	ORIGIN	PURPOSE
MATURITY STAGE	A pre-defined maturity stage ranging from 1 (low) to 5 (high).	Levels and names are based on the one used in CMM.	To quantify the evaluation of one factor / scope / time item on a well-defined scale.
ORGANISATIONAL ENTITY	The organizational entity that defines the unit of analysis and to which the model is being applied (e.g. a division, business unit, subsidiary).	The organizational entity is defined on a case-by-case base by the participating organization.	1. Acknowledgement that in reality BPM does not comply to every implementation. 2. To enable internal comparison and assessment between entities. 3. To enable the implementation of specific strategies. 4. To identify and maximize leverage of internal knowledge sources and sharing.
SCOPE TIME	When the model is applied.	Variable selected by the organization applying the model.	1. To enable the understanding of the current position an internal baseline. 2. To enable the reutilization of the model over time so that to assess progress in a longitudinal study.
COVERAGE	The extent to which BPM practices are applicable to the assessed entity.	Concept based on the notions of efficiency and effectiveness in similar models (DeToro and McCabe, 1997).	1. Recognizing the importance of the standardized and consistent distribution of BPM capabilities.
PROFICIENCY	The perceived utility of BPM practices.	Concept based on the notions of efficiency and effectiveness in similar models (DeToro and McCabe, 1997).	1. Recognizing the quality of BPM capabilities.

Source: de Bruin, Rosemann, 2005.

Summing up, the basic criterion for assessing maturity is the *responsibility* of a given entity, understood as the ability and willingness to behave in a predictable manner and in accordance with generally recognized standards and norms. If traditionally maturity is defined as a normatively postulated and socially valued way of proceeding, the economic practice refers to it as the ability of the studied phenomenon to meet specific requirements, e.g. social, institutional or environmental. This comes in certain levels and degrees, referring to its spread, comprehensiveness, strength and quality of its impact, as well as the readiness and capacity to perform the assigned functions and tasks, and implement the set goals (Skrzypek, 2013). By analyzing the maturity levels, one may assess the phenomena effectiveness, direction and strength of current and foreseen impact. According to Fisher (2004), higher maturity proves higher efficiency / value, lower costs, greater satisfaction of clients / implementers / participants, building on it a permanent competitive advantage of users or other entities. Thus, knowledge on maturity of phenomena makes sense and legitimacy.

Mapping knowledge on the environment for reducing complexity and achieving business excellence

Given the diversity and various types of critical changes, and breakthroughs (Brătianu and Orzea, 2011), e.g. technological, social, economic, cultural and environmental, overlapping new trends, approaches and concepts (in the field of modern organization management as well), the complexity of management processes and the need to systematize the emerged knowledge are continuously increasing. At their turn, the latter intensify the complexity of the former, setting a feedback loop which continuously feeds itself. The more chaotic the information is, the more difficult is to create sustainable added value, business excellence or competitive advantages. An effective solution might be the systematic mapping of knowledge or the so-called knowledge maps (Yeleneva, Chervenkova, & Andreev, 2020; Zanin & Bagnoli, 2015; Brozova, Subrt, & Bartoska, 2008; Zhou, Zhang, & Jin, 2007). They are facilitated by the proper transfer and use of the acquired data, information and knowledge (Zhuge, 2006). Not only that they aid understanding on emerging realities, but thanks to the fact that they are shared, acquired and exchanged, they are systematically updated, gradually becoming more useful, and generating new knowledge (Borghoff, 1998). Maps successfully illustrate the popularity, importance, influence and maturity of analyzed phenomena and trends. Moreover, they highlight connections, and the course of the reading process and inference about them. In practice, mapping the knowledge equals its audit. Different types of maps require different information on resources, skills, behavior patterns, etc., knowledge on scope and flows (implemented and / or recommended). Unfortunately, some (as the latter) are rather difficult to measure due to their intangible nature, non-standardization and non-linearity (Shutte & Snyman, 2006). Even so, mapping and the afferent resulting knowledge maps create sustainable collective knowledge base, counting a limited number of "white spots" and duplicated data (Bhanushali, 2010). Maps, as tools for visualizing collective knowledge (Troise, 2021; Yan, Hong, & Warren, 2021; Kudryavtsev, et al., 2020; Alsufyev & Gavrilova, 2016) resources in a given area, also provide a reference framework for many individual activities, including the measurement of their effectiveness. They are also kind of signposts allowing for quick finding of currently critical information, necessary knowledge in a short time (Gray, 1999; Wexler, 2001), or directions of further proceedings or development.

Table 2. Dimensions of the BPMM model

Criterion	Type of knowledge map	Description
Structure	Topographic map	Presents the location of people in the organization along with the skills and knowledge assigned to them at a specific level
	Information resource map	Indicates the location and method of storing information
	Geographic Information System (GIS)	Presents the geographical distribution of knowledge resources in a specific space
	Knowledge source map	Created for specific projects, it indicates who has and where there are valuable resources of knowledge of a given type

Criterion	Type of knowledge map	Description
	Knowledge matrices	Links different categories of knowledge to the respective management systems
Purpose of preparation	Competency map	Locates competences and specialist; answers the question "who-what?"
	Strategy map	Indicates the purpose of using knowledge; answers the question "what for?"
	Concept map	Supports creativity, describes existing ideas; answers the question "what do we already know?"
	Cause and effect map	Serves to describe the course of processes; answers the question "how does it work?"
	Cognitive map	Indicates the procedure algorithm. Describes the applied solution for problems identification, by answering the question "how to solve the problem?"

Source: Own elaboration based on: Probst, Raub, & Romhadt, 2002; Wexler, 2001; Plumley, 2003.

The above-mentioned maps can take many forms and serve different purposes (Peer, et al., 2021; Fonseca and Domingues, 2017, Dima, Vasilache, 2016), as for example:

a) word cloud maps (i.e. https://www.123rf.com/photo_51011715_word-cloud-for-business-analysis-strategie-and-excellence.html) - a tag cloud (also known as a wordle or weighted list in visual design) is a visual representation of text data, often used to depict keyword metadata on websites, or to visualize free form text. Tags are usually single words, the importance of which is shown by using font size or color.
b) bibliographic analysis maps such as the ones made with VOS Viewer software (i.e. https://www.vosviewer.com), a tool for building bibliometric networks. They may include journals, researchers, or individual publications, and they can be built based on citation, bibliographic coupling, co-citation, or co-authorship relations. VOS viewer also offers text mining functionality that can be used to construct and visualize co-occurrence networks of important terms extracted from a body of scientific literature.
c) maps visualizing spatially a selected issue, area of knowledge, problem, dependencies and connections built on the basis of the transformation of data and information contained in the form of text or numbers / digits into a graphical interpretation of statistical data (https://infuture.institute/en/trends-map-2022/).
d) maps of processes (e.g. map of the production process or Value Stream Map, https://www.enginess.io/insights/beginners-guide-process-mapping) as graphical presentation of the data of operations, and interdependencies in the organization between departments.
e) geographic information systems (GIS) maps (i.e. http://www.datagis.pl) overcomes some shortage of the traditional paper map containing preset data. In the latter case, a significant part of data could go unnoticed, while the former, GIS, enable the compilation of a selected data set at one time. It therefore facilitates the manipulation of input data and the extraction of various kind of results.
f) various business and marketing maps / canvases (e.g. Value Proposition Canvas (VPC) = Value Proposition Canvas, i.e. https://vimeo.com/152440705) work as tools for

marketing experts, product owners, and value creators. The Value Proposition Canvas (VPC) was conceived for helping entrepreneurs visualize, design and test value created by their business for the customers. It enables a fit between the customer and the product/service of the company. Business Model Canvas systematically reflects the business model, and thus facilitating the analysis of each business segment apart.

As it organizes the collected data, information and knowledge, maps, no matter their type, work both as useful analytical tools supporting (strategic) decision-making processes, and as valuable sources of inspiration.

Nevertheless, the benefits of mapping are not well-known, which is why they lack popularity and appreciation (Behrens, et al., 2018). This causes a significant research gap in the field of assessing suitability of its use for achieving Business Excellence in the demanding and dynamic SMART WORLD. To support business excellence and organization management in the SMART WORLD era, special attention was paid to showing the advantages of tracking the maturity of the emerging technological, social, economic, environmental and communication trends and their associated management concepts.

Based on the above multi-threaded literature review, the research question was formulated as following: *how could tracking and mapping trends reduce the complexity of the SMART WORLD environment and thus support the modern organizations Business Excellence?*

Four research assumptions were proposed to be tested:

- A1: The SMART WORLD environment and its associated requirements enhance the complexity of the processes that lead to modern organizations' Business Excellence.
- A2: Assessing the maturity of socio-economic phenomena emerging in the SMART WORLD reduces the complexity of the market environment.
- A3: Mapping knowledge on emerging trends and phenomena facilitates the achievement of business excellence in the SMART WORLD environment.
- A4: Constant tracking of universal awareness, acceptance, and impact of individual emerging new trends and concepts in the SMART WORLD era reduces the complexity of achieving Business Excellence in modern organizations.

Methodology

Desk research was carried out to achieve the objectives of the work. Trends of the emerging socio-economic phenomena were reviewed and resulted in a list of +100 trends identified. Out of these, 54 trends were selected and grouped into 5 clusters: social, technological, finance (economic), environmental, communicational. At this achievement contributed the research carried out by the Infuture Institute (https://infuture.institute/mapa-trendow/).

The data used in this article was collected by means of extensive CAWI type survey, conceived by authors. During the period December 2021 - February 2022, the form was addressed to a population of more than 600 representatives of enterprises operating in Poland and/or Lithuania (N = 600). A total number of 107 respondents (n_{PL} = 50 and n_L = 57) filled in the form. Respondents were asked to rate a total of 54 currently observed and scientifically debated trends of the Industry 4.0 era (see Figure 4) into 3 categories:

- concerning the potential impact of the trend implementation and its likelihood of shaping the competitive advantage in the Industry 4.0;
- concerning trend implementation in the surveyed organizations;
- concerning the trend maturity in a given industry.

For each of the above categories, a basic 5-point Likert scale was used. The questionnaires included brief description of the trend to facilitate its understanding.

Some counterpart studies were performed: a. Global Megatrends 2022 by PMI (PMI, 2022), resulting in 6 key global megatrends (such as Digital Disruption, Climate Crisis, Demographic Shifts, Economic Shifts, Labor Shortages, Civil, Civic and Equality Movements) identified, and b. Global Marketing Trends by Deloitte, resulting in Purpose – a beacon for growth, Authentically inclusive marketing, Building the intelligent creative engine, Meeting customers in a cookieless world, Designing a human-first data experience, Elevating the hybrid experience, Supercharging customer service with AI (Deloitte, 2022).

SOCIAL SPHERE TRENDS

- **SOC_1** → **PHYSICAL EXPERIENCE** → Growing need for real experience and the physical involvement of recipients both in the virtual and offline world.
- **SOC_2** → **SEXUALITY ON** → Trend where sex and sexuality are no longer taboos, even in the case of sex of the elderly or the disabled.
- **SOC_3** → **AGING SOCIETY** → The Aging Society trend responds to the needs of a new group (by 2050, one in three Europeans will be over 60 years old), whose activity in various areas of life will increase.
- **SOC_4** → **INCLUSION & DIVERSITY** → Trend indicates the growing need for openness to all social groups and supporting their activity
- **SOC_5** → **WOMEN EMPOWERMENT** → Trend concerns the increasing role of women in social, economic and political life.
- **SOC_6** → **TRULY SMART CITY** → Trend associated with the growing need for approach allowing cities to be created in accordance with the principle of broadly understood sustainable development.
- **SOC_7** → **MIND CARE** → Trend covers all activities related to the broadly understood mental health category (society the so-called mental wellbeing).
- **SOC_8** → **FEAR(LESS) NATION** → Trend focus on building a disinformation resistant, informed and responsible society
- **SOC_9** → **SCATTERED TRIBES** → Trend indicates that groups built above classical social divisions - i.e. an individual's affiliation to a group is determined, for example, by values and interests.
- **SOC_10** → **OFFLINE LIVING** → Reduction of the use of technology for life beyond the digital world.
- **SOC_11** → **DIGITAL WELLBEING** → JOMO (Joy of Missing Out) or digital detox is one of the ways to maintain a balance between the online and offline world

FINANCE (ECONOMICAL) SPHERE TRENDS

- **FIN_1** → **CONSCIOUS CONSUMERISM** → A trend that refers to the growing awareness of consumers and responsible brand creation.
- **FIN_2** → **GLOBALIZATION 4.0** → Trend combining solutions and ideas that respond to the changing needs and realities of the modern, digitized world.
- **FIN_3** → **BLOCKCHAIN ECONOMY** → Trend of the economy based on transparency and decentralized and distributed database.
- **FIN_4** → **SOFT CITY** → Idea of a non-silent city where residents find it easier to relate to each other and the places around them.
- **FIN_5** → **ENERGY-ORIENTED ECONOMY** → Trend indicating that economy should be oriented towards conscious and sustainable use of resources.
- **FIN_6** → **FLIGHT SHAME** → Trend of growing environmental awareness that indicates need for abandonment of air travel in favor of transport methods with a lower carbon footprint.

TECHNOLOGICAL SPHERE TRENDS

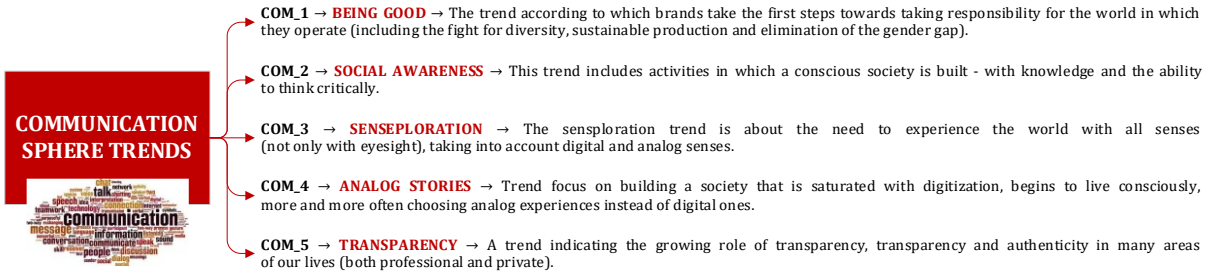
- **TECH_1** → **IMPLEMENTING AI** → Implementation of artificial intelligence to solutions based on big data and neural networks implemented in many areas of life.
- **TECH_2** → **5G** → fifth generation mobile technology = chance to change and accelerate the development of many areas, including transport, internet of things, telemedicine and smart cities.
- **TECH_3** → **DIGITAL HEALTH** → Development of digital solutions (VR, AR, AI or IoT) in the field of broadly understood health.
- **TECH_4** → **SEAMLESS TECH** → Technology becomes almost imperceptible to people, while being part of everyday life.
- **TECH_5** → **SMART LIVING** → New technologies support everyday human life to make it easier.
- **TECH_6** → **DATA IS THE NEW BLACK** → Growing role of data which is one of the most important elements of digital transformation.
- **TECH_7** → **IMMERSIVE ART** → Combination of art and technology, which creates solutions that fully engage the recipient.
- **TECH_8** → **MAKE TECH HUMAN** → Trend indicating the increasing role of technology in the service of people.
- **TECH_9** → **HUMAN TECH BOND** → Technology acts as an intermediary between people, i.e. devices will allow us to feel the physical presence of another human being.
- **TECH_10** → **BABY TECH** → Technologies (including IoT, VR, AI) that may be used to support parents in their care for the upbringing and health of their children.
- **TECH_11** → **HUMAN+** → Technologies that may be used to improve the human body with the help of technology, so as to overcome human limitations.

TECHNOLOGICAL SPHERE TRENDS

- **TECH_12** → **AI FOR HUMANITY** → Use of the Artificial intelligence (AI) to create solutions where humanity is a priority.
- **TECH_13** → **ETHICAL TECH** → Need to create a code according to which artificial intelligence would develop and function taking into account the imperative of ethics.
- **TECH_14** → **MIRROR WORLD** → Everything has its counterpart and representation in the digital world.
- **TECH_15** → **QUANTUM COMPUTING** → Technology that redefines concepts such as efficiency, speed and data security.
- **TECH_16** → **BCI (BRAIN-COMPUTER INTERFACE)** → Technology that will allow to create an interface that would allow communication between the human brain and an external (mechanical) device.
- **TECH_17** → **PRIVACY** → Trend connected with fight for privacy due to tendency of governments to trace citizens activities and online behavior.
- **TECH_18** → **SELF-DRIVING CARS** → Technology of autonomous cars which if appear on the market at the mass scale will revolutionize many industries.
- **TECH_19** → **VOICE TECHNOLOGY** → Technology allowing even further development and more specialized use of voice assistants or chatbots in communication.
- **TECH_20** → **VIRTUAL ASSISTANTS** → Siri, Alexa, Google Assistant, [...] are becoming an integral part of human life, facilitating everyday functioning.
- **TECH_21** → **DEEPFAKES (MALICIOUS USAGE OF AI)** → Artificial intelligence allows for image and voice processing that creates a false message, very close to the authentic one.

ENVIRONMENTAL SPHERE TRENDS

- **ENV_1** → **LIFE AFTER PLASTIC** → Trend indicating the need to search for equally durable and cheap alternatives to excessive use of plastic.
- **ENV_2** → **REFILL CULTURE** → Trend indicating the need to reuse of resources.
- **ENV_3** → **IMPLEMENTING SUSTAINABILITY** → Solutions focused on the Sustainable Development Goals established by the United Nations aimed at: eradicating poverty, protecting the natural environment or promoting sustainable industry.
- **ENV_4** → **BIODESIGN** → As part of the Biodesign trend, living organisms (including fungi, bacteria and algae) are used to produce sustainable materials.
- **ENV_5** → **ECO CONSCIOUS** → Trend includes activities aimed at counteracting the advancing consumerism and materialism.
- **ENV_6** → **NATURE-FOCUSED** → Trend refers to activities in the context of, inter alia, environmental protection and caring for biodiversity.
- **ENV_7** → **MAKE AIR GREENER** → Trend indicating the need to use plants and greenery to purify the air, both in a social and environmental context.
- **ENV_8** → **NEW MATERIALS** → This trend indicates the use of, among others artificial leather to create new products for everyday use, in line with a sustainable approach to design.
- **ENV_9** → **CIRCULAR ECONOMY** → Trend Which assumes that the value of products, materials and resources is to be kept in the economy for as long as possible in order to reduce waste generation to a minimum.
- **ENV_10** → **TOWARDS ELECTRIC MOBILITY** → Trend according to which electric cars are becoming an integral part of a SMART, sustainable city and as so help to the development of the Implementing Sustainability trend.
- **ENV_11** → **ECOENERGY** → Due to the growing energy awareness and environmental lobbying, the market and interest in renewable energy sources is constantly growing.



** High resolution version available at: https://tiny.pl/9n611*

Read more about trends:	
SOCIAL sphere trends	(Saniuk, Grabowska, & Gajdzik, 2020; de Hoyos Guevara, et al., 2020; Minchev, 2020; Pena-Cabrera, Lomas, & Lefranc, 2019; Salimova, et al., 2019)
COMMUNICATION sphere trends	(Minchev, 2020; Strach, 2018; Szombathelyi, Waldbuesser, & Tench, 2015; Servaes & Tamayo, 2013)
TECHNOLOGICAL sphere trends	(Xu, 2022; Rojas, et al., 2021; Adamik & Sikora-Fernandez, 2021; Oztemel & Gursev, 2020; Ojra, 2019; Lom, Pribyl, & Svitek, 2016)
FINANCE (ECONOMICAL) sphere trends	(Amosha, Pidorycheva, & Zemliankin, 2021; Mhlanga, 2020; Mardiana, et al., 2020; Pazaitis, De Filippi & Kostakis, 2017; Pepper, Jackson, & Uzzell, 2009)
ENVIRONMENTAL sphere trends	(Adamik, et all., 2021; Mondejar, et al., 2021; Prause & Atari, 2017; Quoquab & Mohammad, 2016; Mazlan, Redzuan, & Abu Bakar, 2014)

Figure 4. Specific Industry 4.0 trends and their estimated impact on the development of business models based on co-production & co-creation

Source: Own elaboration.

For adding knowledge on the selected trends (factors), and thus facilitating their proper mapping and consequently the decrease of complexity in the SMART WORLD Business Excellence building processes, each trend maturity level was analyzed by considering three key areas (scopes):

- potential impact of the trend implementation and its likelihood of shaping the competitive advantage in the Industry 4.0;
- trend implementation in the surveyed organizations;
- trend maturity in a given industry.

For each of the above categories, a basic 5-point Likert scale was used (see table 3 below).

Table 3. Grading scale in the survey questionnaire

Trend implementation in the enterprise	**Potential impact of the trend implementation and its likelihood of shaping the competitive advantage in the Industry 4.0**	**Trend maturity in the industry**
1 very low → we do not even consider its implementation	1 no impact → this trend implementation does not translate into the shaping of a competitive advantage	1 We do not see this trend or the opportunities for its development and the possibility of entering the mainstream
2 low → we are not implementing it yet, but we are planning on it	2 low impact → the trend implementation enables an easy-to-eliminate very short-term market advantage	2 foresight level → long-term perspective, the trend takes over 20 years to enter the mainstream
3 moderate → we have already started to prepare the trend implementation	3 mediocre influence → the trend implementation enables a short-term advantage	3 innovation level → medium-term perspective, the trend needs 5 to 20 years to enter the mainstream
4 high → we are currently implementing the trend	4 high impact → trend implementation enables a medium-term advantage	4 reactive level → short-term perspective, the trend takes 1 to 5 years to enter the mainstream
5 very high → we are one of the leading implementers of the trend	5 very high impact → trend implementation enable a long-term advantage	5 new normal level → currently the leading trend in the mainstream

Source: Authors' own elaboration

The 107 correctly filled in questionnaires (n_{PL} = 50 and n_L = 57) were aggregated, anonymized and statistically processed, then a template for the results presentation was developed.

Table 4. Specific Industry 4.0 trends and their estimated impact on the development of business models based on co-production & co-creation – data presentation legend

LP	TREND NAME		MATURITY LEVEL	IMPLEMENTATION LEVEL	IMPACT LEVEL	Σ IMPLEMENTATION & IMPACT LEVEL	PEARSON's correlation coefficient		
							MAT - IMPL	MAT - IMPA	IMPL - IMPA
…	<CODE>	<NAME>		…	…	…	…	…	…
…	…	…		…	…	…	…	…	…
…	…	…		…	…	…	…	…	…
…	…	…		…	…	…	…	…	…

** Trends will be sorted by MATURITY LEVEL score*

where:

- Maturity level = average value of the parameter "trend maturity level"

- Implementation level = average value of the parameter "trend implementation level"
- Impact level = average value of the parameter "potential impact of implementing the trend"
- PEARSON's correlation coefficient:
  - MAT – IMPL = the value of the Pearson correlation index Maturity / Implementation
  - MAT – IMPA = the value of the Pearson correlation index Maturity / Impact
  - IMPL – IMPA = the value of the Pearson correlation index Implementation / Impact

MATURITY LEVEL VALUES RANGE:

- value > 3,25 = new normal level → currently the leading trend in the mainstream
- value 3,00 ÷ 3,24 = reactive level → short-term perspective, the trend takes 1 to 5 years to enter the mainstream
- value 2,5 ÷ 2,99 = innovation level → medium-term perspective (5 to 20 years to enter the mainstream)
- value 2,2 ÷ 2,49 = foresight level → long-term perspective (over 20 years to enter the mainstream)
- value < 2,19 = trend most likely will not be developed in the future (lack of even long-term perspective)

IMPLEMENTATION & IMPACT LEVEL VALUES RANGE:

- value > 3 → high or very high = strong impact on the possibility of shaping a competitive advantage
- value 2 ÷ 3 → mediocre impact on the possibility of shaping a competitive advantage
- value < 2 → low impact on the possibility of shaping a competitive advantage

PEARSON'S CORRELATION COEFFICIENT VALUES RANGE:

- value > 0,70 → high correlation
- value 0,50 ÷ 0,69 → mediocre correlation
- value < 0,50 → low correlation

Source: Authors' own elaboration.

Results

For emphasizing the benefits of the knowledge mapping process, the data collected was displayed in different ways and by applying different methods, each of them organizing and illustrating them in its specific manner. Their simple utilization raises awareness, reduces complexity and therefore facilitates the implementation of Business Excellence by the afferent entity.

Map A, shown in Table 5, is a tabular display, which, on the one hand, provides a large amount of information, but, on the other hand, could make the interpretation rather challenging for the less experienced users, portraying results in black and white. However, if a "color filter" is used, the map gains in fluency and eloquence, and mature trends are easier to observe (table 5).

Table 5. Map A: Maturity, levels of implementation and impact of the specific, "SMART WORLD era", trends - own research results (pilot studies)

#	CODE	TREND NAME	AVARAGE			∑ (IMPL_IMPA)	PEARSON's correlation coefficient		
			MAT	IMPLEMENTATION	IMPACT		MAT – IMPL	MAT – IMPA	IMPL – IMPA
1	FIN_1	CONSCIOUS CONSUMERISM	3,505	3,252	3,467	6,719	0,760	0,766	0,775
2	SOC_5	WOMEN EMPOWERMENT	3,430	3,402	3,327	6,729	0,733	0,733	0,730
3	COM_5	TRANSPARENCY	3,411	3,196	3,290	6,486	0,728	0,696	0,697
4	TECH_17	PRIVACY	3,290	3,028	3,131	6,159	0,675	0,610	0,660
5	COM_2	SOCIAL AWARENESS	3,252	3,000	3,252	6,252	0,660	0,583	0,645
6	SOC_7	MIND CARE	3,243	3,009	3,579	6,588	0,595	0,414	0,318
7	SOC_4	INCLUSION & DIVERSITY	3,215	3,336	3,514	6,850	0,761	0,727	0,727
8	FIN_2	GLOBALIZATION 4.0	3,215	2,916	3,196	6,112	0,678	0,664	0,733
9	SOC_1	PHYSICAL EXPERIENCE	3,131	2,991	3,290	6,281	0,733	0,568	0,508
10	ENV_1	LIFE AFTER PLASTIC	3,121	2,916	3,084	6,000	0,720	0,716	0,738
11	TECH_5	SMART LIVING	3,075	2,907	3,364	6,271	0,599	0,641	0,643
12	FIN_5	ENERGY-ORIENTED ECONOMY	3,056	2,785	3,047	5,832	0,802	0,807	0,796
13	TECH_6	DATA IS THE NEW BLACK	3,028	2,888	3,336	6,224	0,727	0,705	0,679
14	TECH_8	MAKE TECH HUMAN	3,028	2,738	3,280	6,018	0,681	0,649	0,650
15	ENV_2	REFILL CULTURE	3,019	2,748	2,972	5,720	0,778	0,746	0,740
16	ENV_5	ECO CONSCIOUS	3,009	2,850	2,944	5,794	0,716	0,718	0,774
17	ENV_9	CIRCULAR ECONOMY	3,009	2,617	2,860	5,477	0,736	0,723	0,799
18	ENV_3	IMPLEMENTING SUSTAINABILITY	2,981	2,794	2,972	5,766	0,804	0,753	0,775
19	ENV_6	NATURE-FOCUSED	2,972	2,850	3,084	5,934	0,767	0,726	0,800
20	COM_1	BEING GOOD	2,925	2,551	2,860	5,411	0,744	0,650	0,739
21	SOC_3	AGING SOCIETY	2,916	2,710	3,178	5,888	0,723	0,690	0,714
22	TECH_2	5G	2,907	2,364	3,056	5,420	0,679	0,667	0,641
23	SOC_6	TRULY SMART CITY	2,888	2,720	3,234	5,954	0,590	0,688	0,685
24	ENV_11	ECOENERGY	2,860	2,486	2,692	5,178	0,768	0,693	0,689
25	SOC_11	DIGITAL WELLBEING	2,850	2,458	2,757	5,215	0,738	0,763	0,798
26	SOC_9	SCATTERED TRIBES	2,822	2,673	3,000	5,673	0,751	0,795	0,819
27	SOC_8	FEAR(LESS) NATION	2,813	2,664	3,028	5,692	0,709	0,676	0,601
28	TECH_20	VIRTUAL ASSISTANTS	2,710	2,215	2,963	5,178	0,683	0,701	0,641
29	ENV_7	MAKE AIR GREENER	2,692	2,383	2,495	4,878	0,777	0,782	0,725
30	TECH_1	IMPLEMENTING AI	2,598	2,206	3,047	5,253	0,735	0,702	0,585
31	ENV_10	TOWARDS ELECTRIC MOBILITY	2,589	2,121	2,411	4,532	0,704	0,676	0,727
32	TECH_4	SEAMLESS TECH	2,570	2,336	2,860	5,196	0,713	0,679	0,562
33	FIN_3	BLOCKCHAIN ECONOMY	2,477	2,103	2,654	4,757	0,666	0,687	0,683
34	TECH_3	DIGITAL HEALTH	2,467	2,009	2,486	4,495	0,732	0,697	0,710
35	TECH_12	AI FOR HUMANITY	2,449	2,093	2,757	4,850	0,783	0,740	0,632
36	TECH_19	VOICE TECHNOLOGY	2,449	1,935	2,589	4,524	0,652	0,665	0,564
37	ENV_8	NEW MATERIALS	2,449	2,019	2,252	4,271	0,732	0,758	0,811
38	COM_4	ANALOG STORIES	2,430	2,196	2,318	4,514	0,833	0,777	0,857
39	COM_3	SENSEPLORATION	2,402	2,140	2,458	4,598	0,781	0,855	0,850
40	ENV_4	BIODESIGN	2,290	1,925	2,364	4,289	0,812	0,805	0,724
41	TECH_7	IMMERSIVE ART	2,280	2,150	2,411	4,561	0,777	0,849	0,817
42	TECH_9	HUMAN TECH BOND	2,243	1,925	2,449	4,374	0,802	0,701	0,652
43	TECH_11	HUMAN+	2,234	1,944	2,374	4,318	0,766	0,664	0,695
44	TECH_14	MIRROR WORLD	2,234	2,009	2,336	4,345	0,821	0,778	0,772
45	FIN_4	SOFT CITY	2,215	1,869	2,346	4,215	0,689	0,719	0,708
46	SOC_10	OFFLINE LIVING	2,178	2,028	2,262	4,290	0,736	0,792	0,780
47	TECH_10	BABY TECH	2,159	1,879	2,318	4,197	0,737	0,808	0,704
48	FIN_6	FLIGHT SHAME	2,037	1,925	2,093	4,018	0,870	0,854	0,851
49	TECH_13	ETHICAL TECH	2,000	1,729	2,168	3,897	0,763	0,727	0,707
50	TECH_15	QUANTUM COMPUTING	2,000	1,589	2,393	3,982	0,610	0,702	0,495
51	TECH_18	SELF-DRIVING CARS	1,953	1,589	2,000	3,589	0,662	0,665	0,684
52	SOC_2	SEXUALITY ON	1,822	1,776	1,935	3,711	0,751	0,746	0,783
53	TECH_16	BCI	1,813	1,551	2,477	4,028	0,675	0,563	0,390
54	TECH_21	DEEPFAKES	1,804	1,486	1,785	3,271	0,617	0,663	0,648

Maturity level	*New normal or reactive level trends*	*Innovation or foresight level trends*	*No future trends*
Impact or Implementation level	*High impact / implementation level*	*Moderate impact / implementation level*	*Low impact / implementation level*
Pearson's correlation coefficient values	*High correlation*	*Mediocre correlation*	*Low correlation*

Source: Authors' own research.

This method of data mapping shows as the most mature trends today (the highest maturity in N = 107): conscious consumerism (3.505), women empowerment (3.402) and

transparency (3.411). When it comes to their implementation, the ranking changes: women empowerment (3,402), inclusion & diversity (3,336) and conscious consumerism (3,252), while the highest impact on the development of the surveyed enterprises is exerted by: mind care (3.579), inclusion & diversity (3.514), conscious consumerism (3.467).

As seen, the separate analysis of individual scopes enables important observations; however, it obscures the picture, and rather increases complexity (triggers detailed analyzes, comparisons and decisions). If a broader perspective is taken, the first 7 trends of the above map are observed as key trends, while the next 10 (numbers 7 to 17 on the map), represent trends that are going to enter the mainstream (their strength will probably significantly increase in the next 3-5 years). According to the respondents, the next trends from the list have a chance to become significant in the long run. Last, the trends marked in red ("no future" trends) are of a particular interest, as respondents portrayed them one-step ahead the society (modern societies are not ready yet to understand and accept them, and to adapt to them).

This confirms assumption A1, which states that "The SMART WORLD environment and its associated requirements enhance the complexity of the processes that lead to modern organizations' Business Excellence". The data in the knowledge maps report a large number of different type of phenomena occurring at different times, they influencing the achievement of Business Excellence in the SMART WORLD.

The next step consists of the illustration by means of map B (Figure 5) of the maturity featuring the studied trends.

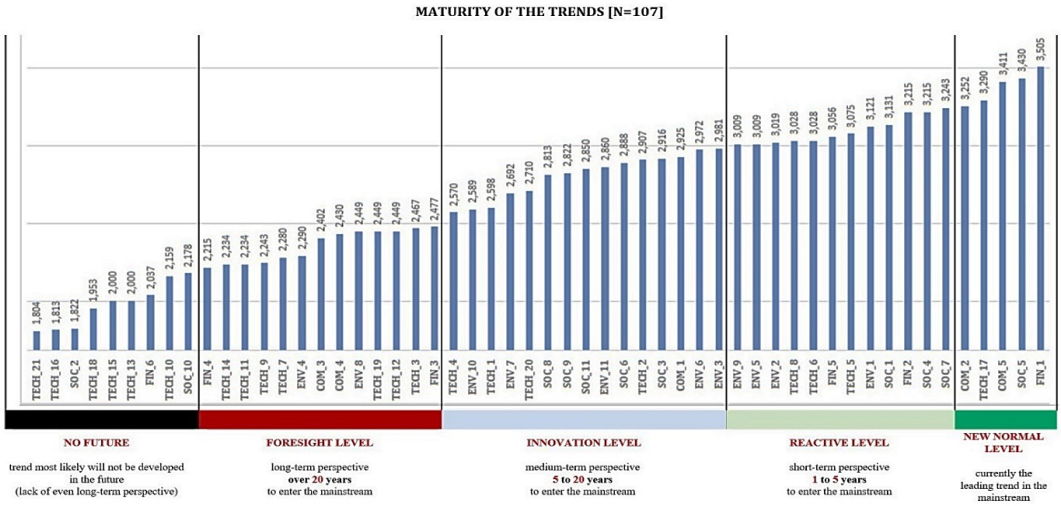


Figure 5. Map B: maturity, levels of implementation and impact of the specific, "SMART WORLD era" trends - own research results of pilot studies – graphic presentation (mapping)

Source: Authors' own elaboration.

The above mapping method (Figure 5) significantly organizes the data and allows for generalization from the time horizon perspective. This helps decision-makers taking appropriate directions of development and choosing the right solution to focus on, when seeking to achieve Business Excellence. However, only the possibility to map a certain phenomenon in different ways (e.g. Map A & Map B), does not significantly decrease the complexity of the decision-making.

According to the survey, there are 5 trends in the mainstream today: the leading one is FIN_1 - Conscious Consumerism, the next are SOC_5 - Woman empowerment, COM_5 -

Transparency, TECH_17 - Smart living and COM_2 - Social awareness. That makes two communication trends, one trend from social environment, one from the eco-financial and another one from the technological environment; no environmental trends in the mainstream. However, on the short term (i.e. 1-5 years to enter the mainstream), there are 4 environmental trends mentioned, including ENV_1 - Life after plastic, ENV_2 - Refill culture, ENV_5 - Eco conscious, and ENV_9 - Circular economy. Besides these, other 3 sociological trends (SOC_7, SOC_4 and SOC_1), 3 technological trends (TECH_5, TECH_6, TECH_8) and 2 eco-financial (FIN_2 and FIN_5) seems to emerge. The next 5 environmental and 5 social and 4 technological trends are considered to emerge and develop on a medium-long run (they are currently at the innovation stage).

Also, according to the respondents, there is no room for the development of 6 technological trends, two social, and one eco-financial. The following are the least likely to develop: TECH_21 (protection from) Deepfakes and malicious usage of AI, TECH_16 - BCI (Brain-Computer Interface), TECH_10 - Baby tech, TECH_13 - Ethical tech, TECH_15 - Quantum computing, 18 - Self-driving cars. "No-future" category also includes SOC_10 - Scattered tribes, SOC_2 - Sexuality on and FIN_6 - Flight shame.

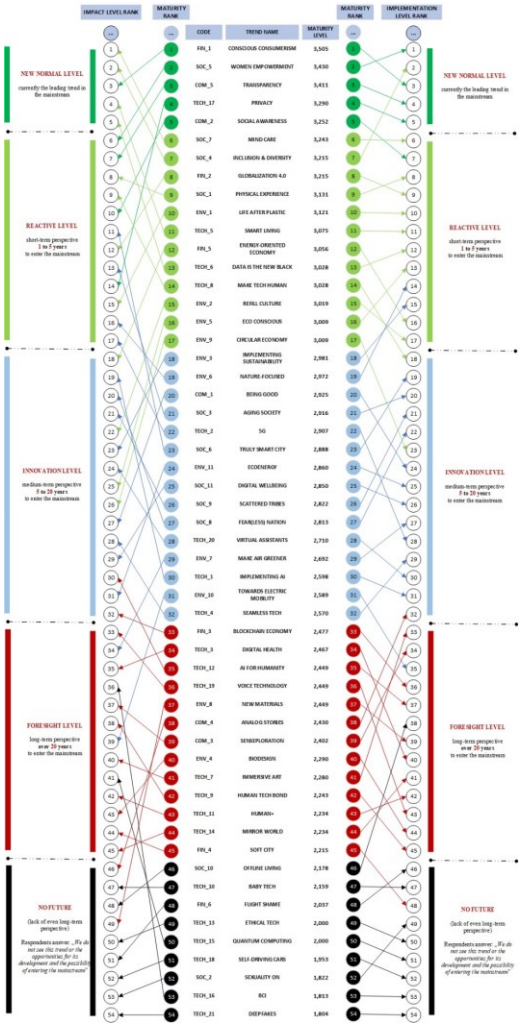
The map shows that social trends are perceived as having the strongest impact on the contemporary organizations (8 in Top 25 and 4 in Top 10), technological trends (5 in the Top 25 and 3 in the Top 10) and environmental trends (6 in the Top 25). Although not considered mature trends, being set on the reactive level, they are expected to enter the mainstream soon (1-5 years), or in the next 5-20 years (those that are at the innovative stage).

These findings confirm the assumptions A2 and A3, where:

- A2: Assessing the maturity of socio-economic phenomena emerging in the SMART WORLD reduces the complexity of the market environment.
- A3: Mapping knowledge on emerging trends and phenomena facilitates the achievement of business excellence in the SMART WORLD environment.

In other words, a greater efficiency in classifying and reading the maturity of phenomena and processes can increase the efficiency of SMART WORLD Business Excellence implementation.

As a last step of the analysis, the importance of systematic multi-faceted analysis was probed. In this vein, multi-faceted maps were overlapped, better integrating the collected data and resulting into the map C. This illustrates, too, the expected dynamics of the analyzed phenomena: the current ranking positions (current maturity levels, levels of implementation and the impact of individual trends in the opinion of respondents), individual trends under study, but also their foreseen changes.



** High resolution version available at: https://tiny.pl/9n6js*

Figure 6. Map C: maturity, levels of implementation and impact of the specific, "SMART WORLD era" trends - own research results of pilot studies – graphic presentation (mapping)

Source: Authors' own elaboration.

The above diagram (Figure 6) displays a large number of arrows, which, despite the fact that are differently colored, still does not annul complexity. However, by giving clues on trends implementation and their impact, they better shed light then the basic raw numerical data. Thus, assumption A4 is approved.

Discussion, conclusions and practical implications

The performed analyses provide evidence on the importance of tracking and mapping of the environment and the afferent management. They gained importance with the advent of the SMART WORLD era. The multitude and variety of accompanying phenomena (especially the new ones as previously unknown technologies, resources, competences, etc.) increase the difficulty of effective monitoring, management and achieving Business Excellence. The phenomena currently positioned in the mainstream (New Normal - currently leading trends) challenge the economic entities, and the awareness of the inevitability of coming in the short term (Reactive level = 1 to 5 years to enter to enter the mainstream) and in the medium term

(Innovation Level = 5 to 20 years) of subsequent changes intensifies the complexity of most decision-making processes (Elbanna, Thanos, & Jansen, 2020; Heaslip, 2015)

Assessing the maturity level of phenomena and processes is of particular importance. Despite the growing number of tools for the strategic analysis, not all of them give explicit and accurate results, and not all of them are user friendly for practitioners. Therefore, there is a high need for simplified tools facilitating understanding and effective response to the socio-economic dynamics.

Tracking and Mapping of knowledge and its associated tools facilitate awareness and in-depth understanding of complex phenomena, by providing contemporary decision-makers, managers, strategists visual, easy to read and interpret complementary maps (Buehring & Bishop, 2020).

The survey questioning 107 entrepreneurs about the contemporary and emerging trends, and their subsequent mapping and tracking by means of the map system indicate the latter:

- allows not only to identify, but also to bring closer to the decision-maker the most real phenomena / changes / challenges (scope-time; scope-factor); this facilitates the narrowing down of the activities and giving room focus for strategical technologies, processes, areas, etc.;
- allows, after applying the filtering of respondents, to prepare "mapping and tracking" of key trends of the SMART WORLD era for selected groups of stakeholders, and then enables their comparison. The set of these data can give rise to conclusions and recommendations that are important for the implementation of the Business Excellence of these groups. For the described survey sample one can compile maps of trends relevant to:
  - manufacturing, trading and service enterprises;
  - small, medium and large;
  - enterprises operating in Poland and Lithuania;

Moreover, through a thoroughly prepared set of analyzes, it allows not only to identify current state of the SMART WORLD environment (step 1 of “tracking and mapping”), but also prepare various scenarios and solutions for the future, i.e. designing, probing one's capabilities in terms of responding to the expected challenges in the near future, such as technological, economic, human resources, communication or environmental (step 2 of “tracking and mapping”). The authors believe that the proposed concept and the tools that operationalize it may constitute a valuable contribution to the so-called "The toolbox of the SMART WORLD era strategist". Not only can they help reduce the complexity of decision-making processes, but also facilitate the direction of building Business Excellence by the organizations that use them.

Limitations of the research and further studies

One first limitation is the high complexity and length of survey form (assessments of 54 trends from 3 perspectives). This situation could not be prevented due to the construction of the list of trends currently studied by the Infuture Institute, which inspired the author's research. Another limitation that hindered the research process was the limited (sometimes negligible) knowledge of the respondents about the latest / breakthrough phenomena and social, technological and economic processes. The respondents in the study were practitioners representing various industries. Focusing on the effectiveness of activities in

their industries, not all respondents efficiently navigated solutions that they had not used. One quick fix was the short "glossary of terms" accompanying the study. This also helped in assuring the same meaning to each term, as the glossary was provided to respondents in their native language.

As a further study, it is planned to take as a first step the carrying out of a research on scientists' opinion for comparative purposes. In the same vein, a comparison between the present research findings and some other data collected in EU countries, as well as USA, is highly considered.

Also, as further research plans, the design of an integrated platform dedicated to comprehensive management of tracking and mapping processes has already been started.

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