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Note on the link between Circular Economy and technology-oriented theories of sustainable development: A literature review

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Nowadays, Circular Economy (CE) is one of the most popular notions among politicians, practitioners and academics. While several researchers indicate that the concept of the Circular Economy synthesises the major schools of thought regarding sustainability, no explicit analysis is available on the roots, theoretical backgrounds, and the novelty of CE or its understanding on the role of technology and innovation in achieving the goals of sustainable development. Based on a structured literature review, the goal of this paper is twofold: first, it aims to identify the main conceptual similarities and differences between the earlier technology-oriented concepts of sustainability and the Circular Economy, and secondly, it attempts to present how technological innovation is conceptualised in the Circular Economy. The main findings suggest that CE relies heavily on the previous theories of technology-oriented research streams, especially Blue Economy, emphasising the importance of innovation cascades and system innovation.

Keywords: sustainable development, innovation, circular economy, eco-efficiency, blue economy, natural capitalism, industrial ecology, bio- and eco-mimicry.

JEL codes: M29, O31, P4.

Introduction

In the last decades, several theoretical concepts have emerged that deal with the achievement of the different goals of sustainable development. Today, Circular Economy (CE) is one of the most popular notions among politicians, practitioners and academics (Brennan et al. 2015; Murray et al. 2017; Milios 2018). Theoretical and empirical studies on CE have grown exponentially (see Kirchherr et al. 2017) and the promotion of circular economy is now high on the EU and Chinese policy agendas, translating into a range of policy actions (Pardo et al. 2018; Ranta et al. 2018). While some authors (Ghisellini et al. 2016; Reike et al. 2018; Winans et al. 2017) stress the fact that the concept of CE has a long history, several researchers (Frodermann 2018; Korhonen et al. 2018a; Lacy–Rutquist 2016; Smol et al. 2017; Tonelli–Cristoni 2019) and the Ellen MacArthur Foundation (EMF 2012) state that CE synthesises the major schools of thought related to the technology-oriented theories of sustainability. The distinctive feature of technology-oriented views on sustainability, i.e. the concepts of eco-efficiency, bio- and eco-mimicry,

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natural capitalism, industrial ecology, the blue economy, is that these approaches attach a prominent role to technological development and innovation, albeit in varying degrees and ways. Although the concept of CE is defined as belonging to these approaches, in order to acknowledge its theoretical background and novelty, it is necessary to understand how technology-oriented theories view sustainability and the role of technology and innovation in achieving the goals of sustainable development. This paper aims to address these two challenges by investigating two research questions:

1. What are the main conceptual similarities and differences between the earlier technology-oriented concepts of sustainability and the Circular Economy?

2. How is innovation conceptualised in the Circular Economy?

To work towards answering these research questions, the paper has the following structure: the next section provides a brief summary of the circular economy, then the linkages between previous technology-oriented views and CE are identified by highlighting the targeted sustainability dimensions, key principles, tools and methods applied, and the role of technological innovation. Finally, key findings and arguments are summarised.

Definition of the concept of Circular Economy

Despite its popularity, there is no clear consensus on the meaning of Circular Economy in the literature. According to the report of the Ellen MacArthur Foundation (2012. 7), CE is "an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models." Based on an extensive literature review, Geissdoerfer et al. (2017. 762) define "CE as a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling." Similarly, by analysing 144 CE definitions published in peer-reviewed journals, Kirchherr et al. (2017. 224) concluded that "CE describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering

materials in production/distribution and consumption processes, thus operational at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations". By contrast, Korhonen et al. (2018b. 547) highlight that CE is a sustainable development initiative "with the objective of reducing the societal production-consumption systems' linear material and energy throughput flows by applying materials cycles, renewable and cascade-type energy flows to the linear system. CE promotes high-value material cycles alongside more traditional recycling and develops systems approaches to the cooperation of producers, consumers and other societal actors in sustainable development work". Accordingly, the three basic principles of circular economy are the preservation and enhancement of natural capital, the optimisation of resource yields by the maximisation of resource value over time in both technical and biological cycles, and the fostering of system effectiveness, which are ensured by the minimal use of raw materials and waste, the use of circular planning and production systems which supports the reintegration of products into the system at the end phase of their life-cycle, the use of new and innovative business models, the use of closed-loop material cycles, renewable and cascade-type flows, and the strong cooperation of producers, consumers and other societal actors (EMF 2012).

The central assumption of CE is that contemporary economic and industrial structures are linear by nature, preferring mass production and low production costs. These economic and industrial structures do not support the sustainability aspects of the economy and lead to the overuse of natural resources and raw materials as well as to the creation of a huge amount of waste. Therefore, in the concept of CE, the final consumption of goods must be based on a "functional service economy", in which the rental of goods replaces the sale of goods. Products should be designed and manufactured by using renewable natural resources whenever it is possible, materials should be cascaded across different applications until the end of their useful life, when materials must be returned to nature to enrich natural capital (EMF 2012). It is also emphasised that, while in biological cycles raw material and components can be safely returned to nature when reuse is no longer viable, in technological cycles, in order to preserve

and maintain local resources, to eliminate wastes and negative environmental externalities, and to extend the useful life of products, prevention should be ensured by system thinking approaches through refuse, rethink and redesign strategies and reverse cycles whereby materials are conceived to return to the production processes through sharing, maintenance, repairing, refurbishing, remanufacturing and recycling (Potting et al. 2017).

A scientific consensus supports that CE and its mechanisms can be implemented at different levels, from a single company perspective to a value chain approach to the global economy. While, at the corporate level, companies can ensure a high level of circularity by applying circular design methodologies (green design, design for durability, design for reverse cycles) and reverse cycles and by developing innovative business models in which value propositions stimulate use- and result-oriented services (Tonelli–Cristoni 2019; Urbinati et al. 2017), at the regional level, cascade-type co-operations and collaborations across the different product chain actors and sectors should be encouraged and can be manifested in many forms: from information sharing through co-production to industrial symbiosis. At the macro level, activities from micro and meso levels are included and the macroeconomic impacts of these actions on the regional and national scale are investigated (Tonelli–Cristoni 2019, Frodemann 2018). In order to highlight how and from which disciplines of technology-orientated views these CE principles and mechanisms are originated, in the next section the linkages between previous theories and CE are identified in relation to sustainability dimensions, main mechanisms and principles, and the roles and preferred levels of technological innovations.

The comparison of CE principles, mechanisms, assumptions, and propositions regarding the role of technological innovation with the technology-oriented theories is conducted based on a comprehensive literature review (CLR).

The five-step process of CLR was structured as follows: 1. Scope definition; 2. Conceptualisation of the topic; 3. Literature search; 4. Literature analysis and synthesis; and 5) Research agenda. The literature sources used in this paper are the most widely accepted and cited works of major representatives of different theoretical fields.

Links to sustainability, key assumptions, mechanisms and principles of previous technology-oriented theories

The role of technology in minimising the negative environmental impacts (e.g. emissions, waste generation, extensive use of natural resources and raw materials) of economic processes is at the core of eco-efficiency studies (see Schaltegger–Strum 1989, Schmidheiny 1992, von Weizsächer et al. 1997). The OECD (1998. 7) defines eco-efficiency as "the efficiency with which ecological resources are used to meet human needs". Huppes–Ishikawa (2007) make a distinction between the analysis of value creation and the analysis of environmental improvements which can be combined with the inversion options. Based on this, they identified four fundamental variants of eco-efficiency: environmental productivity, environmental intensity, environmental improvement cost, and environmental cost-effectiveness. According to Schmidheiny (1992), key mechanisms for eco-efficiency improvements are minimising resource usage and negative environmental impacts and ensuring the availability of high-quality products and services for users. Eco-efficiency implementation levels include micro, meso and macro levels as well since eco-efficiency calculations can be used to assess and compare the performance of production processes, products, companies, sectors or regions, countries or macro-entities (Ehrenfeld 2005).

Industrial ecology (see Ehrenfeld 1997, McDonough-Braungart 1998, Hinterberger et al. 2003) argues that the negative environmental impacts of economic and industrial processes can be attributed to the fact that these man-made, artificial processes are open, therefore instead of enhancing eco-efficiency, new design principles should be defined, elaborated and utilised to support the integration of these artificial production and consumption systems into the natural environment, with production processes being designed from the beginning according to local ecological constraints. Thus, industrial ecology aims at creating closed-loop processes and transformation from simple linear material flows into a highly integrated system with closed cyclical material flows in which the waste serves as input from one process for other processes (Ayres–Ayres 2002; Graedel 1994). This also means that biological metabolism should be transposed into technical metabolism, i.e. into industrial material and energy flows. As Barros and Neto (2011) argue, the key assumptions and mechanisms of industrial ecology include the use of biological analogy and systems perspective, the necessity of technological change, the importance of corporate actions, dematerialisation and

eco-efficiency and the use of forward-looking research and practice. Although industrial ecology studies usually focus on the corporate level, the control of production and industrial processes is also extended to inter-company, intersectoral or cross-sectoral relationships by emphasising the importance of industrial symbiosis. In addition, some authors (see Suh 2009) extend the scope of research by investigating regional and global material, energy, economic and even social flows.

The concept of biomimicry (Benyus 1997) assumes – by treating nature as a model, a measure and a mentor and by mimicking natural processes – that natural laws and logic can be adapted to human needs and complex problems, and innovative solutions can be found which inherently support sustainability. The theory simultaneously builds upon biological, design, natural, innovation, life, and technological aspects and the interrelations among them. The nine principles of life represent the central elements of this theory and serve as a basis for activities aimed to find solutions for the transition towards more sustainable production systems (McGregor 2013). The Biomimicry Design Spiral methodology (Benyus 1997), which can be used to guide product designers and other innovators through nature's reiterative design process, contains five steps: 1. Distil the design function; 2. Translate it into biological terms; 3. Discover natural models; 4. Emulate nature's strategy; and 5. Evaluate the design against the life principles of Nature.

Despite the fact that the biomimicry concept puts great emphasis on the bio-inspired solutions and represents an innovation process in which mimicking local flora and fauna is the key to developing eco-innovations, Marshall (2007) states that the theory of biomimicry only supports the use of incremental and radical innovations at the product level, focusing only on the environmental dimension of sustainability, and relying heavily on mass markets and experts. He also criticises the applicability of life principles by saying that the spiral design model follows the traditional model of innovation complemented with the step of searching for biological analogies. To eliminate these contradictions and shortcomings, eco-mimicry stresses the following aspects (Marshall 2007):

• Efforts should be made to develop local technologies that are socially and environmentally responsible and are inspired by the characteristics of the local ecosystem, flora and fauna.

• Nature-inspired innovations should be sustainable by nature.

• Nature-inspired innovations should support democratisation and localism.
• System thinking is necessary for designing bio-inspired local solutions.

Natural capitalism goes beyond the design and implementation of closed-loop systems by claiming the replacement of products with services and the investment in the natural capital of the ecosystem. The four key business actions of the approach involve the dramatic increase in the productivity of natural resources, the shift towards biologically inspired production models, the movement from products to solutions-based business models, and the reinvestment in natural capital (Lovins et al. 1999). In order to eliminate the wasteful and environmentally harmful use of natural resources, natural capitalism stresses that the product and process design activities of companies should rely on system approaches and the implementation of the whole system design should go hand in hand with the adaptation of environmentally friendly, eco-efficient technologies. Hawken et al. (1999) suggest that design activities concentrate on radically new, bio-inspired solutions and new business models building upon closed-loop material flows and zero waste. Instead of the sale of goods, new business models put the focus on problem solving. New models are initiated by the enhancement of the service intensity of products and product-service replacements, while value propositions rely on resource-efficient and closed material cycles.

According to Pauli (2010), the dominant economic model starts from the presumption of the principle of scarcity, coupled with unemployment, intra-generational inequity, waste, and by-product generation. Today's prevailing production and consumption systems are dominated and influenced by some multinational companies and their global supplier network. Furthermore, the linear processes of production and consumption systems neglect and ignore the potential synergies that lie in symbiosis and systemic thinking, and the development of these systems is guaranteed only by incremental innovations, and the process of decision making is cost and profit-oriented. Pauli (2010) also stresses that, in order to achieve the main goals of sustainable development, a new type of socio-economic system should be created that supports life, enhances flexibility, builds upon the existing goods and sustainable processes, operates according to physical processes, creates opportunities for learning, adapts to the continuously changing conditions, satisfies basic needs, develops the sense of responsibility, creates jobs, builds communities and provides multiple sources of income. The blue economy integrates the key principles of previous technology-oriented

theories of sustainability, i.e. learning from nature, life-cycle analysis, zero-waste and emission, fit to local conditions, the substitution of something with nothing, the creation of locally contextualised systems, industrial symbiosis, and by using the concept of innovation cascades, blue innovations are in line with the concepts of system innovation theories.

Geissdoerfer et al. (2017) identified eight types of relationships between sustainability and CE and highlighted that CE is viewed as a condition for sustainability (conditional, strong conditional or necessary but not sufficient conditional relations), a beneficial relation (beneficial, subset or degree relations), or a trade-off in literature at the same time. While the first two major categories of relations support the concept that CE can be seen as a relatively new approach for the achievement of sustainability goals, supporters of the trade-off relationship between sustainability and CE argue that circularity and closed-loop systems can have costs and benefits in regard to sustainability, which can also lead to negative outcomes and foster certain aspects of sustainability, while lacking others.

Kirchherr et al. (2017) indicated that, in the relevant literature sources, social, environmental, economic and even time dimensions of sustainability were also expressed. However, based on the definitions examined, they found that CE's link to sustainable development was weak and that most authors saw CE as an avenue for economic prosperity, whereas previous scholars conducting narrative reviews of the CE literature had argued that CE would be mostly concerned with environmental aims. Nevertheless, Kalmykova et al. (2018) and Korhonen et al. (2018a) highlight that the social dimensions of sustainability should be also integrated into the concept of CE. These types of relations are not unique among the different technology-oriented theories, since the concept of eco-efficiency stresses the importance of the economic dimensions of sustainability by analysing the positive impacts of environmental and economic efficiency on corporate competitiveness. The explicit analysis of the social dimension of sustainability is also missing in the concepts of biomimicry and industrial ecology which emphasise the primacy of environmental and economic dimensions. Ecomimicry studies take one step further and deal explicitly with the local social impacts of nature-driven solutions. In natural capitalism and blue economy studies, economic, social and environmental dimensions have equal importance.

Regarding the key principles of CE (Table 1), it can be stated that, besides focusing on the negative environmental impacts of economic processes, CE builds

heavily on the concepts of natural capitalism and blue economy by stressing that natural, economic and social problems are complex and interrelated and by incorporating the key principles derived from these research streams into its own framework and structure.

Table 1. Key principles of technology-oriented theories of sustainability

Research streams	Key Principles
Eco-efficiency	Pollution prevention, Cleaner production, Zero-waste, LCA, 3Rs
Biomimicry	Nature as a model, a mentor, a measure, Learning from nature, Nine principles of life, Bio-inspired design
Eco-mimicry	Creating locally contextualised systems, Learning from nature
Natural capitalism	Eco-efficiency, product-service replacement, investment in natural capital, Zero waste, Learning from nature, LCA
Industrial ecology	Cradle-to-grave, Cradle-to-cradle, Zero-waste economy, LCA, Closed-loop cycles, Industrial symbiosis, Learning from nature, Industrial symbiosis
Blue economy	Cradle-to-grave, Cradle-to-cradle, Zero waste economy, Industrial ecology and symbiosis, Learning from nature, LCA, Creating locally contextualised systems, Cascades of innovations
Circular economy	Pollution prevention, Cleaner production, Cradle-to-grave, Cradle-to-cradle, Zero-waste economy, LCA, Closed-loop cycles, 3-6Rs, Creating locally contextualised systems, Industrial symbiosis, Learning from nature, Cascades of innovations

Source: own edition

Sustainable development and the role of innovation

Theories and research studies emphasising the role of technological innovation in achieving sustainability are diverse in terms of the types and radicalness of the innovations they highlight. As for the type of innovation, according to the definitions of Hammelskamp (1997) and Kemp and Arundel (1998), eco-innovations include such new or modified products, services, processes, techniques, practices and systems by which the degradation of the natural environment can be avoidable, while sustainable innovations are composed of such new or modified products, services, processes, techniques, practices and systems which have positive social and environmental impacts. Regarding the scale and extent of innovation, as Tukker and Tischner (2006) and Carrillo-Hermosilla et al. (2010) illustrate, sustainable innovations can be classified as system optimisation, system redesign and system innovation. While innovations supporting system optimisation induce

the incremental development of system elements without changing the structure of the incumbent socio-economic systems, system redesign needs incremental and functional innovations provoking the modification of subsystems and interactions among these subsystems within the existing boundaries of the system. System innovations are the sum of innovations appearing in the different dimensions of socio-economic systems that not only supports the appearance of new products and services but also allows a new system building on new logics, practices, and principles to be achieved.

Eco-efficiency theory (Yuang–Chen 2011) states that technological innovations are essential for the co-enforcement of economic and environmental aspects and stresses the importance of technological innovations supporting the reduction in the material and energy intensity of products and services and in the use of toxic materials, the recyclability of raw materials, the increase in the use of sustainable and renewable resources, the improvement of product life cycles, durability and the service intensity of products. While eco-efficiency studies emphasise the importance of the more innovative use of resources, incremental and sustaining innovations, other technology-optimistic authors (see Kemp 2008) argue that the development and diffusion of more radical and disruptive technologies are the keys to solutions. According to this theory, the main task of the state is to stimulate the innovation activity of companies, while companies are responsible for minimising the resource, emission and energy intensity of the production and service processes.

Industrial ecology argues that achieving the environmental, social and economic goals of sustainable development depends heavily on the innovation activities and efforts of companies. These innovations should not only target compliance with the regulation but also encourage the development and tracking of voluntary strategies (Doranova et al. 2012, Barros–Neto 2011). In this regard, different types of meso-level innovations supporting the appearance of industrial symbiosis are of particular importance, leading to (Doranova et al. 2012. 76):

• Environmental benefits such as improved resource use efficiency, reduced use of non-renewable resources and reduced pollutant emissions;

• Economic benefits such as reductions in the resource inputs costs in production, reductions in waste management costs and the generation of additional income due to higher values of by-product and waste streams;

• Business benefits such as improved relationships with external parties, development of a green image, new products, and new markets; and

• Social benefits such as new employment and raising the quality of existing jobs by creating cleaner and safer natural and working environments.

Although most of the literature sources on the theory of industrial ecology deal only implicitly with the potential role of society and the state in achieving sustainability goals, studies focusing on social life cycle analysis, social embeddedness (Boons et al. 2009) and the role and impacts of state interventions (Hendricks–Giannini-Spohn 2003, Green–Randles 2006) have been gaining ground.

As it was mentioned above, while the concept of biomimicry emphasises the role of bio-driven technological innovations at the micro level that sustains the key elements and interactions between these elements of the dominant technological system, Marshall (2007) states that an eco-mimicry strategy of innovation should be developed, with community members being involved in the definition of social, economic and environmental needs and in the preparation and execution of design projects. Local communities should be encouraged to identify the adaptability of strategies helping local animals and plants so as to solve problems in their life-worlds, to generate and execute ideas and problem-solving concepts based on natural solutions.

Similar to the theory of industrial ecology, business model innovations are at the core of the concept of natural capitalism. Tukker (2004) differentiates between product-oriented (product-related service, advice and consultancy), use-oriented (product lease, product renting or sharing, product pooling) and result-oriented (activity management/outsourcing, pay-per-service unit, functional result) services. In the first group, the business model is still geared towards the sales of products, but some extra services are added and business model innovations focus on the incremental and sustaining improvement of the eco-efficiency of services. The second category contains traditional business models which are not geared towards selling products, i.e. the product stays in the ownership of the provider, being made available in a different form and sometimes shared by a number of users. These business model innovations can be sustaining or disruptive by nature; however, the environmental gains related to them are limited. In the last group of product-service systems, business models build upon the agreement between the client and the provider on a result and there is no pre-determined product

involved. According to Tukker (2004), in these cases, providers are motivated to search for radical and disruptive innovations which can lead to new service and system designs.

Even though Pauli (2010) does not give a clear definition for blue innovations, he implicitly suggests that, in the technology-oriented views of sustainable development, environmental innovations are emphasised, while innovations reinforcing the Blue Economy concept are considered to be sustainable ones. In this sense, eco-innovations are necessary but not sufficient to support the transformation of dominant socio-economic systems and draw attention to system innovations that have social, economic and environmental advantages, in which a new logic builds upon disruptive innovations using natural processes, fitting to local conditions, serving the principle of "substitution of something with nothing" and contributing to the change of one socio-technological regime to another. Blue economy stresses the use of solutions-based business models that promote the re-design of highly polluting industrial processes by incorporating the value of natural capital into business activities, replacing processes that use rare resources and high energy with cleaner technologies, and harnessing the power of cascading systems, where the waste flows of one process become the input of another (Tonelli–Cristoni 2019). New local creative and risk-taking entrepreneurs have a distinctive role in initiating, implementing and diffusing innovations. These sustainable innovations can generate income and induce new business models using wastes and by-products as inputs in a sustainable way. New socio-techno-economic systems rely on the network of new business models and support the revitalisation of communities as well. Blue innovations support the appearance of the desired socio-technological and socio-economic systems that build upon local resources and self-regulating closed cycles, utilise the principles of ecosystems and natural processes, support system-wide reconstruction and ensure the economic and efficient utilisation of wastes and by-products. According to Pauli (2010), the radical changes of social and customer behaviours, norms, attitudes, rules and habits are essential conditions for the diffusion of sustainable innovations since "ecosystems evolve towards ever-higher levels of efficiency and diversity due to contributions from all players" (Pauli 2010. 69), while "consumer enthusiasm and the desire of concerned citizens to contribute to solutions for sustainability can end up as an obstacle to embarking on real change" (Pauli 2010. 63). Innovations complying with the principles of the Blue Economy are ones that, due to their

ripple effects, induce radical modifications and changes not only in the inherent structure of the existing technological systems but also in the interconnections among different technological systems with unique social functions. Only this can ensure that the waves of innovations in and out of a given technological system generate modifications in the different dimensions of the existing technological regimes towards social, economic and environmental sustainability.

Regarding the concept of CE, it can be stated that, similarly to the eco-efficiency theory, it supports the use of environmentally friendly incremental and sustaining innovations which help to reduce the raw material and energy intensity of the existing products and services, to eliminate the use of toxic materials, while contributing to the increased recyclability of raw materials and the use of sustainable and renewable resources and extending the useful life of products and services. This means that, as regards the types of innovations at the corporate level, product and process innovations appear in the form of circular supplies and resource recovery, remanufacturing, reuse, refurbish, repurpose, recycle and repair. However, the theory also emphasises that organisations have to redesign and rethink not only their products and processes but also their business models to become independent from scarce resources through renewability, reuse, repair, refurbishing, capacity, platform sharing, product service replacement, product life extension and dematerialisation (Boons et al. 2013, Urbinati et al. 2017). It is important to note that, regarding the stimulation of radical and disruptive business model innovations as system innovations at the corporate level, there is a strong parallel between the theories of natural capitalism, industrial ecology, system innovation and the Blue Economy concept.

With regard to the use of technology in product chains, Potting et al. (2017) distinguish three types of technological transitions, i.e. transitions in which the emergence of a specific, radically new technology is central and shapes the transition process itself while requiring socio-institutional changes, transitions in which socio-institutional change is at the forefront while technological innovation plays a minor role, and transitions in which socio-institutional change is central, but which are facilitated by enabling technology. They state that the common feature of these transitions is a change in the innovation direction from a linear to a circular application of materials, which can be promoted by incremental and radical innovations or the combination of both. Furthermore, literature on CE at the meso level stresses that, beyond intra-firm optimisations and innovations, inter-firm

and inter-industrial optimisations are needed in the form of symbiosis, cascades of innovations or interlinked business models to achieve those socio-technical system-level transformations that are indispensable to the goals of sustainable development (Winans et al. 2017, Tseng et al. 2018). Macro-level CE studies and surveys also indicate that the state and its authorities play an important role in the implementation of innovations supporting the realisation of the circular economy by providing a supportive legislative environment, information, education, and platforms for discussions and by linking organisations to individuals, households and societal infrastructures (Droste et al. 2016). Society is also responsible for supporting new intra- or inter-firm business models since institutional innovations in its attitudes, routines and habits contribute to the acceptance and diffusion of new value propositions by companies and industries (Hobson–Lynch 2016). For a detailed comparison, see Appendices A and B.

Accordingly, comparing the different notions and propositions regarding the types, levels and roles of technological and non-technological innovations promoted by the technology-oriented views of sustainability, it can be concluded, that circular economy shares the view of the blue economy concept as it emphasises the following:

• Socio-technological regimes are composed of heterogeneous elements and actors, with local entrepreneurs being in an initiating position;

• The macro-level environment is the arena responsible for opening windows of opportunity and pressuring to search for innovative solutions;

• Technological regimes support incremental and sustaining innovation whereby new technological innovations appear in technological niches;

• Dominant technological solutions should be replaced with new innovative solutions based on the strategies of refuse, rethink, reduce, repair, refurbish, remanufacture, repurpose, recycle and recover;

• New market entrants and innovative business models have a spill-over effect on the actors and elements of the existing socio-technical system and value-generating processes;

• The development of a shared vision and networking should be supported by political institutions;

• Institutional innovations are essential for the transition process, but they can have negative and positive consequences as well.

Conclusions

As the literature review illustrates, despite the fact that Circular Economy has been interpreted as a new concept, its main principles and mechanisms can be found in the earlier technology-oriented theories of sustainability. Circular Economy uses and reinterprets the principles of Blue Economy and Natural Capitalism, with a deeper focus on corporate strategies and tools applicable in reverse cycles. It can also be stated that CE, just like the Blue Economy, is a mixture and rethinking of the earlier views of technology-oriented research streams rather than a radically new theory, which emphasises the role of system innovations in the transition to sustainable development.

A full examination of the advantages, limits and unintended consequences of the CE concept is beyond the scope of this paper. Further research is also needed to make an extensive and deeper analysis of theoretical and empirical literature on circular economy.

References

Ayres, R. U.–Ayres, L. W. 2002. *A Handbook of Industrial Ecology*. Cheltenham: Edward Elgar.

Barros, M. C. L.–Neto, J. A. 2011. *A Study on Common Topics in Industrial Ecology and Operations Management publication*. http://sistemas-producao.net/redecoop/en/working-papers/production-and-sustainability, downloaded: 23.10.2014.

Benyus, J. 1997. *Biomimicry, Innovation inspired by nature*. New York: Williams & Morrow.

Boons, F.–Howard-Grenville, J. 2009. *The Social Embeddedness of Industrial Ecology.* Cheltenham: Edward Elgar.

Boons, F.–Montalvo, C.–Quist, J.–Wagner, M. 2013. Sustainable Innovation, Business Models and Economic Performance: An Overview. *Journal of Cleaner Production* 45, 1–8.

Brennan, G.–Tennant, M.–Blomsma, F. 2015. Business and production solutions: closing the loop. In: Kopnina, H.–Shoreman-Ouimet, E. (eds.) *Sustainability: Key Issues.* London: Earthscan, 219–239.

Carrillo-Hermosilla, J.–del Rio Gonzalez, P.–Könnölä, P. 2010. Diversity of eco-innovations: Reflections from selected case studies. *Journal of Cleaner Production* 18, 1073–1083.

Doranova, A.–Miedzinski, M.–van der Veen, G.–Reid, A.–Riviera, L.–Ploeg, M.–Carlberg, M.–Joller, M. 2012. *Business Models for Systemic Eco-innovations*. http://www.technopolis-group.com/wp-content/uploads/2014/04, downloaded: 15.08.2014.

Droste, N.–Hansjürgens, B.–Kuikman, P.–Otter, N.–Antikainen, R.–Leskinen, P.–Pitkänen, K.–Saikku, L.–Loiseau, E.–Thomsen, M. 2016. Steering innovations towards a

green economy: Understanding government intervention. *Journal of Cleaner Production* 135, 426–434.

Ehrenfeld, J. R. 1997. Industrial ecology: a framework for product and process design. *Journal of Cleaner Production* 5(1–2), 87–96.

Ehrenfeld, J. R. 2005. Eco-efficiency Philosophy, Theory, and Tools. *Journal of Industrial Ecology* 9(4), 6–8.

Frodermann, L. 2018. *Exploratory Study on Circular Economy Approaches*. Wiesbaden: Springer.

EMF 2012. *Towards the Circular Economy.* http://www.ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-CircularEconomy-vol.1.pdf; downloaded: 19.06.2019.

Geissdoerfer, M.–Savaget, P. I.–Bocken, N. M. P.–Hultink, E. J. 2017. The Circular Economy – a new sustainability paradigm? *Journal of Cleaner Production* 143, 757–768.

Ghisellini, P.–Cialani, C.–Ulgiati, S. 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production* 114, 11–32.

Graedel, T. 1994. Industrial Ecology: Definition and Implementation. In: Socolow, R.–Andrews, C.–Berkhout, F.–Thomas, V. (eds.) *Industrial ecology and global change.* Cambridge: Cambridge University Press, 23–42.

Green, K.–Randles, S. 2006. *Industrial Ecology and Spaces of Innovation.* Cheltenham: Edward Elgar.

Hammelskamp, J. 1997. Environmental Policy Instruments and their Effects on Innovation. *European Planning Studies* 2, 177–194.

Hawken, P.–Lovins, A. B.–Lovins, L. H. 1999. *Natural Capitalism, The Next Industrial Revolution*. London: Earthscan.

Hendricks, B.–Giannini-Spohn, S. 2003. The role of government in ecoindustrial development', In: Cohen-Rosenthal, E.–Musnikow, J. (eds.) *Eco-Industrial Strategies: Unleashing Synergy between Economic Development and the Environment*. Sheffield: Greenleaf, 68–88.

Hinterberger F.–Giljuk, S.–Hammer, M. 2003. *Material Flow Accounting and Analysis (MFA), A Valuable Tool for Analyses of Society-Nature Interrelationship*. http://seri.at/wp-content/uploads, downloaded: 29.09.2005.

Hobson, K.–Lynch, N. 2016. Diversifying and de-growing the circular economy: Radical social transformation in a resource-scarce world. *Futures* 82, 15–25.

Huppes, G.–Ishikawa, M. 2007. *Quantified Eco-Efficiency. An Introduction with Applications*. Dordrecht: Springer.

Kalmykova, Y.–Sadagopan, M.–Rosado, L. 2018. Circular economy – From review of theories and practices to development of implementation tools. *Resources, Conservation and Recycling* 135, 190–201.

Kemp, R.–Arundel, A. 1998. *Survey Indicators for Environmental Innovation.* http://www.sol.no/step/IDEA, downloaded: 11.02.2005.

Kemp, R. 2008. Sustainable technologies do not exist! http://www.dime-eu.org/files/active/0/Kemp, downloaded: 04.12.2008.

Kirchherr, J.–Reike, D.–Hekkert, M. 2017. Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling* 27, 221–232.

Korhonen, J.–Honkasalo, A.–Seppälä, J. 2018a. Circular Economy: The Concept and its Limitations. *Ecological Economics* 143, 37–46.

Korhonen, J.–Nuur, C.–Feldmann, A.–Birkie, S. E. 2018b. Circular economy as an essentially contested concept. *Journal of Cleaner Production* 175(20), 544–552.

Lacy, P.–Rutqvist, J. 2016. *Waste to wealth: The circular economy advantage*. London: Springer.

Lovins, A. B.–Lovins, L. H.–Hawken, P. 1999. A road map for natural capitalism. *Harvard Business Review* 77(3),145–158.

Marshall, A. 2007. *The theory and practice of ecomimicry*. http://espace.library.curtin.edu.au/R?func=dbin-jump-full&local_base=gen01-era02&object_id=20328, downloaded: 23.10.2014.

McDonough, W.–Braungart, M. 1998. The Next Industrial Revolution. *The Atlantic Monthly* 282(4), 82–92.

McGregor, S. L. 2013. Transdisciplinarity and Biomimicry. *Transdisciplinary Journal of Engineering & Science* 4, 57–65.

Milios, L. 2018. Advancing to a Circular Economy: three essential ingredients for a comprehensive policy mix. *Sustainability Science* 13(3), 861–878.

Murray, A.–Skene, K.–Haynes, K. 2017. The circular Economy: an interdisciplinary exploration of the concept and application in a global context. *Journal of Business Ethics* 140(3), 369–380.

OECD 1998. *Eco-efficiency*. http://browse.oecdbookshop.org/oecd, downloaded: 07.04.2008.

Pardo, R.–Schweitzer, J. P. 2018. *A Long-Term Strategy for a European Circular Economy–Setting the Course for Success*. Brussels: Belgium.

Pauli, G. 2010. *Kék gazdaság. 10 év, 100 innováció, 100 millió munkahely.* Pécs: PTE.

Potting, J.–Hekkert, M.–Worrell, E.–Hanemaaijer, A. 2017. *Circular Economy: Measuring Innovation in the Product Chain*. Amsterdam: PBL NEAA.

Ranta, V.–Aarikka-Stenroos, L.–Ritala, P.–Mäkinen, S. J. 2018. Exploring institutional drivers and barriers of the circular economy: a cross-regional comparison of China, the US, and Europe. *Resources, Conservation and Recycling* 135, 70–82.

Reike, D.–Vermeulen, W. J. V.–Witjes, S. 2018. The Circular Economy: New or Refurbished as CE 3.0? – Exploring Controversies in the Conceptualization of the Circular Economy through a Focus on History and Resource Value Retention Options. *Resources, Conservation and Recycling* 135, 246–264.

Schaltegger, S.–Sturm, A. 1989. *Okologieinduzierte entscheidungsprobleme des managements.* WWZ-Discussion Paper No. 8914. Basel: WWZ.

Schmidheiny, S. 1992. *Changing Course: A Global Business Perspective on Development and the Environment*. Cambridge: MIT Press.

Smol, M.–Kulczycka, J.–Avdiushchenko, A. 2017. Circular economy indicators in relation to eco-innovation in European regions. *Clean Technologies and Environmental Policy* 19(3), 669–678.

Suh, S. 2009. *Handbook of Input-Output Economics in Industrial Ecology*. London: Springer.

Tonelli, M.–Cristoni, N. 2019. *Strategic Management and the Circular Economy*. London: Routledge.

Tseng, M. L.–Tan, R. R.–Chiu, A. S.–Chien, C. F.–Kuo, T. C. 2018. Circular Economy meets Industry 4.0: Can big data drive industrial symbiosis? *Resources, Conservation and Recycling* 131, 146–147.

Tukker, A. 2004. Eight types of product–service system: eight ways to sustainability? Experiences from SusProNet. *Business Strategy and the Environment* 13(4), 246–260.

Tukker, A.–Tischner, U. 2006. *New Business for Old Europe. Product Services, Sustainability and Competitiveness*. Sheffield: Greenleaf Publishing Ltd.

Urbinati, A.–Chiaroni, D.–Chiesa, V. 2017. Towards a new taxonomy of circular economy business models. *Journal of Cleaner Production* 168, 487–498.

Yuang, C. J.–Chen, J. L. 2011. Accelerating preliminary eco-innovation design for products that integrates case-based reasoning and TRIZ method. *Journal of Cleaner Production* 19(9–10), 998–1006.

von Weizsächer, E.–Lovins, A. B.–Lovins, L. H. 1997. *Factor Four, Doubling Wealth, Halving Resource Use*. London: Earthscan.

Winans, K.–Kendall, A.–Deng, H. 2017. The History and Current Applications of the Circular Economy Concept. *Renewable and Sustainable Energy Review* 68, 825–833.

Appendices

Appendix A. Key players and their roles in supporting sustainable development in the technology-oriented views of sustainability

Research streams	Role of the state	Role of society	Role of companies	Role of technology
Eco-efficiency Schaltegger–Sturm (1989), Schmidheiny (1992)	Support and stimulate corporate innovation activities	Not in scope	Minimise the material, energy and emission intensity of production and service processes	Technological innovations contributing to the enhancement of the eco-efficiency of existing models
Biomimicry Benyus (1998)	No explicit analysis or guidelines	No explicit analysis	Companies and experts have a key role in the development and use of nature-driven innovative solutions	Nature-driven technologies with lower negative environmental impacts
Ecomimicry Marshall (2007)	Establishment and support of local needs and circumstances, co-operations, support information flows	Local social actors and groups are responsible for participating in innovations fitting to local conditions	Companies and local actors have a key role in the development and use of nature-driven innovative solutions	Nature-driven technologies with lower negative environmental impacts and fitting to local conditions
Natural capitalism Hawken et al. (1999), Lovins et al. (1999)	Create and develop a supportive legislative environment, remove obstacles and support information flows	Generally, no explicit analysis In some cases: Social innovations are needed to accept product-service replacements	Investments in natural capital, use of innovations supporting eco-efficiency, creating new product-service models, use of biomimicry principles, redesign products into services	Technological innovations supporting product-service substitutions and the enhancement of eco-efficiency

Research streams	Role of the state	Role of society	Role of companies	Role of technology
Industrial ecology Ayres–Ayres (2002), Green–Randles (2006), Graedel (1994)	Role of the state is secondary and limited to creating and developing a supportive legislative framework	No explicit analysis	Priority of companies and other business actors in developing and using innovations that support the creation of closed-loop production systems	Technological innovations supporting the creation of closed-loop production and economic systems
Blue Economy Pauli (2010)	Promote local planning and design, local models and concepts leading to closed-loop flows and systems	Explicit need for social and institutional (attitudes, habits, routines) innovation and transformation	Initiating innovations with social, economic and environmental advantages, supporting industrial symbiosis, cooperative R&D projects and technological innovations	Nature-driven technological innovations supporting the substitution of "something with nothing"
Circular Economy Boons et al. (2013), Korhonen et al. (2018), Tonelli–Cristoni (2019), Hobson et al. (2016), Potting et al. (2017), EMF (2012), Droste et al. (2016), Frodermann (2018)	Create and develop a supportive legislative environment, promote education and collaborative platforms and give financial support	Implicit need for social and institutional (attitudes, habits, routines) innovation and transformation	Initiating innovations with social, economic and environmental advantages, supporting industrial symbiosis, cooperative R&D projects and technological innovations	Technological innovations supporting cascade flows, closed-loop economic systems and extending the life cycle of products at all levels

Source: own edition

Appendix B. Role of innovation in the technology-oriented views of sustainability

Research streams	System levels	Role of innovation	Type, degree, and scale of innovation	System analysis methods
Eco-efficiency Schaltegger–Sturm (1989), Schmidheiny (1992)	Macro: not explicit Meso: value chains Micro: Corporate level	Eco-innovations supporting corporate competitiveness	Product/service/process innovations, incremental and sustaining innovations, options for radical innovations, eco-efficiency developments at corporate level.	Only environmental impacts of innovations are examined through calculations
Biomimicry Benyus (1998)	Product/production levels	Nature-driven product and process innovations	Priority of product and process innovations, incremental and radical, sustaining and disruptive innovations.	Case study analysis of a given technological innovation
Ecomimicry Marshall (2007)	Local economy, Product/production levels	Nature-driven product and process innovations	Priority of product and process innovations, radical and disruptive innovations.	Case study analysis of a given technological innovation
Natural capitalism Hawken et al. (1999), Lovins et al. (1999)	Macro: not explicit Meso: Product-Service systems Micro: Companies	Innovations at product-service system level with environmental benefits	Product/service/process innovations, incremental- radical, sustaining-disruptive innovations. Innovations in a given product-market mix, in an industry or at the value chain level.	Case studies
Industrial ecology Ayres–Ayres (2002), Green–Randles (2006), Graedel (1994)	Macro: Regional, global material and energy flows Meso: Industrial symbiosis Micro: Corporate level	Importance of innovations appearing in a given production-consumption system and value chain	Product/service/process innovations, business model innovations. Incremental and radical innovations, subsystems of socio-technical systems in an industry or at the value chain level.	Input-Output models LCA models, green accounting

Research streams	System levels	Role of innovation	Type, degree, and scale of innovation	System analysis methods
Blue Economy Pauli (2010)	Macro: national, global conditions Meso: local, regional economy Micro: technological niches/companies	Blue innovations with environmental, social and economic gains, innovations in technological niches, business models, technological systems/ regimes	Product/service/process innovations, business model innovations. Radical and disruptive innovations, system-level innovations, regional and local economic impacts of innovations are stressed.	Case studies, dynamic system models, business models
Circular Economy Boons et al. (2013), Korhonen et al. (2018), Tonelli–Cristoni (2019), Hobson et al. (2016), Potting et al. (2017), EMF (2012), Droste et al. (2016), Frodermann (2018)	Micro (corporate), meso (industry) and macro-level (national/global) system perspective	Innovations with environmental and economic gains, innovations in business models, value chains, technological systems/ regimes	Product/service/process/ organisational innovations, business model innovations. Radical and disruptive innovations, system-level innovations, regional and local economic impacts of innovations are stressed.	Case studies, dynamic system models, business models

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Practitioners' perception of hotels' family-friendliness

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As family-friendly hotels become more and more popular, and a growing number of hotels claim to be family-friendly, it still remains unclear how the concept of family-friendliness can be best defined. The main aim of our research was to examine how professionals perceived the notion of family-friendliness in their everyday practice. To that end, a series of in-depth expert interviews was conducted. Our results show that family-friendliness still remains a fuzzy concept for both service providers and consumers. Our research established a "continuum of family-friendliness" along the two main dimensions of physical environment and holiday experience where dissatisfiers and delighters of a family-friendly accommodation are identified. Our results contribute to further positioning strategies for hotels that aim to use the "family-friendly" label in their service offering.

Keywords: family tourism, tourist experience, family-friendliness.
JEL codes: L83, Z33, M37, M31.

Introduction

Families travelling with children represent one of the largest, most universal and enduring markets in tourism (Backer–Schänzel 2013). At the same time, family holidays involve an above-average risk to families as well as to service providers: differences in rhythm, attitudes, expectations, and perceptions between family members, increased stress levels on the side of families and a need for (sometimes extreme) flexibility on the side of service providers are all variables related to family vacation.

Despite this dynamic and therefore complex relationship, relatively little academic attention has been paid to the meaning and post-purchase perception of the family vacation experience (Carr 2011). In pursuing the market, tourism service providers have increasingly included family-friendly services in their offer. Thus,

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service providers have developed products and services going from family suites through various activities and animation to packages for family reunions and weddings, and/or offering selling points such as amenities specifically designed to cater to family vacations and children's needs and various discounts for family trips (Kang et al. 2003). Yet, as of today, few professional certification systems are in place to guarantee all generations the experience of a joyful relaxation, which may lead to potential disappointment with hotels that misuse the family-friendly label in their positioning strategy.

Theoretical background

According to Carr (2011. 7), a family is a unit composed of individual components, who, "while unique, are bonded together in complex ways". For one, the members of a family are bonded together in ways unlike any unrelated persons. Moreover, the family is a core unit of society, a central element in the lives of people, and a primary socialisation vehicle for the younger generations. The ideal-typical concept of a nuclear family (i.e. a social group living together consisting of a father, a mother and their child(ren) (Murdock 1949)) is challenged in today's society, bringing about alternative conceptualisations of the composition and thus broadening the definition thereof. Modern families tend to spend more time apart in their everyday lives, making the time spent together on vacation all the more important. At the same time, modern families are also facing various constraints that restrict who – from within the family – will be able to go on vacation at all. All of the above lead to an increased diversity and fluidity of family travel, wherefore a family vacation should be conceptualised as "leisure travel away from the home for more than one day with at least two members of the family involved" (Kennedy-Eden–Gretzel 2016. 462). This can include children travelling with a single parent, but also multigenerational travel, "grand travel", i.e. children travelling with their grandparents (Kang et al. 2003), extended family member travel, i.e. "professional aunts" (Camargo–Tamez 2015), and even pet travel (Gardyn 2001). The change in family structure equally leads to new family vacation patterns, such as weekend vacations in nuclear families (see e.g. de Bloom et al. 2012), or more time-constraint-free vacations during "grand travel" granted by grandparents' "reserve army" (Mikkelsen–Blichfeldt 2018) status. Nonetheless, in later childhood stages, the school calendar equally adds as an extra bottleneck when planning family vacations (Peercy–McCleary 2010).

Most family definitions in the family travel literature take a multigenerational approach, with the presence of children being a stable element therein. "Childhood" can be first defined as a life stage different from adulthood, and second, as a complex process of becoming adult (Carr 2011). As such, childhood includes a wide variety of sub-steps and a complex set of differentiating markers – e.g. chronological (i.e. age), biological (e.g. puberty), social (e.g. acquisition of a growing set of social roles and responsibilities), psychological (i.e. feeling like an adult), and legal (e.g. legal age of emancipation) (Settersten et al. 2015). Some of the most important characteristics of children vis-à-vis adults in terms of holiday experiences are, on the one hand, the fact of being dependent and vulnerable, and on the other, the active gathering of experiences and the fact of being free from the obligations and responsibilities of adults (Carr 2011). These differences will mostly manifest themselves in a set of motivations and attitudes regarding the tourism experience that will heavily differ from those of other members of the family. Yet one should also bear in mind that it can be "potentially difficult to provide for children when definitions of what is appropriate for them, and will be of interest to them, are based on adults' conceptualisations of children" (Carr 2011. 6), and children ought to be equally considered as active agents of the process (Gram 2007).

On the whole, family vacations are a crucial part of family life (Shaw–Dawson 2001), less in breaking normal routine and escaping everyday realities (Backer et al. 2012) than in strengthening relationships and reconnecting as a family unit by spending quality time together and creating collective memories (Shaw et al. 2008), thus enhancing family communication, cohesion and satisfaction with family life (Agate et al. 2009).

In terms of the caveats of family vacations, an escape from everyday reality is harder during this type of holiday as, depending on the nature of the holiday/accommodation, it will still involve a variety of duties, especially for women/mothers (e.g. family caregiving, household chores), making relaxation a relative concept (Shaw et al. 2008), where "a reduction in the pace and standards of work" (Backer–Schänzel 2012. 108) can also be perceived as a positive outcome. Moreover, family leisure requires a considerable amount of preparatory work (mental and physical alike), while a substantial emotional load is omnipresent during the whole process "to ensure that everyone is having a good time" (Trussell–Shaw 2007. 368), making family leisure a "purposive leisure" rather

than a freely chosen or intrinsically motivated one (Shaw–Dawson 2001). In fact, family holidays can be among those factors that can cause "stressful and hostile environments within the family where the holiday desires of one or all family members are not met" (Carr 2006. 138). Individual motivations can be spending time with the family and seeing/doing new things (Backer–Schänzel 2013) for parents, going travelling and being away from the habitual setting for children (Cullingford 1995), having fun and engaging in physical activities for adolescents (Carr 2006). Yet, in their role of parents, adults were equally shown to be performing a "duty of parenthood" (Shaw–Dawson 2001. 227) and making a "sacrifice" (Johns–Gyimóthy 2002. 326) to cater for their children's needs. Moreover, gender differences in motivations among parents also appear in the literature: Shaw and Dawson (2001), for instance, report that mothers are somewhat more concerned with keeping the family together during the vacation, while Such (2006. 197) suggests a difference between mothers' parenting orientation of "being there" for their children and fathers' leisure orientation of "being with" them. All in all, family holidays can be conceptualised as a set of constraints that need to be negotiated (Jackson 2000).

When organising a family vacation, consumers are faced with a complex decision-making task, as it is "a multi-dimensional phenomenon that involves planning, anticipation, trip experience and post-trip recollection" (Lehto et al. 2009. 463). As a service, family tourism can be defined as a supply of services to families. In the case of a hotel, this is manifested in the adaptation of rooms, stay and service experience, and catering to the specific needs of families. Habibah et al. (2015), in their study of the Malaysian context, identify the following service elements largely related to the physical environment that hotels can emphasise in connection with family-friendliness: varied room types, baby and kid needs (e.g. special furniture), catering offer and service design, swimming pool for kids and family, kids club and games for family, kids' games in- and outdoors, family leisure and recreation, family areas, decoration.

The family vacation literature has largely focused on the roles and processes of decision making (Lehto et al. 2009). As a result, one can conclude that family decision styles depend on family situational dynamics and vacation types. While joint decisions seem dominant in the overall consumption process, even though often accompanied with situations of stress (Backer–Schänzel 2013), previous studies find that wives are more active in the early stages of the decision process

(information collection, gatekeeping, setting the pool of available choices), and children have a decisive influence on what programmes the family will effectively choose once on vacation (Lehto et al. 2009). An "ideal family togetherness" (Backer–Schänzel 2013: 160) is hard to achieve, which can lead to family members reporting differently on the lived experience, with mothers being less positive, also possibly affecting their feedback on it.

Methodology and sample characteristics

The research methodology consisted of in-depth expert interviews with participants holding a senior management and/or director position across six different organisations within the Hungarian hospitality industry. Thereby, the present study adopts a realism paradigm (Sobh–Perry 2006) with an in-depth qualitative research approach to map the external reality of the marketplace in an extremely dynamic landscape where practitioners are often a cornerstone in terms of topical knowledge and latest developments (see e.g. Harms et al. 2017; Truong–Simmons 2010). The main research question addressed in the present research is "How do professionals perceive the notion of family-friendliness in their everyday practice?".

As Sobh and Perry (2006) suggest, triangulation is an instrument in the realism paradigm for assessing whether results are generalisable, i.e. an objective reality exists, or, conversely, results fall within the scope of constructivism, i.e. the acceptance of multiple realities (Guba–Lincoln 2005). The present study is a link in a chain of studies using various qualitative methods and angles that investigate the "family-friendliness" construct in depth: Ásványi and Markos-Kujbus (2017), using a student sample, built a database of family-friendly hotels and consumer evaluation criteria thereof, while Csordás et al. (2018a, 2018b) examined online user reviews to determine how family-friendliness could be conceptualised as described by the consumers of family-friendly services. Concurrently, the limitation of the paper is that it resorts to external validity in the evaluation of its results as generalised conclusions might only be drawn from a summary of the stream of research, which is, however, outside the scope of the present study.

A systematic convenience sampling method was used for the interviews. Contacted institutions were selected based on results from previous phases of the aforementioned stream of research the present paper is a part of and on the confirmatory evaluation of the hotels' websites which needed to explicitly

communicate that the institution was family- and/or child-friendly (Table 1). The interviews were conducted until theoretical saturation (Sandelowski 2008) was reached. The interviews took place between March and May in 2019. Table 1 outlines the position for each participant and provides a short description of their respective institutions, with emphasis on hotel location and size, whether the hotel adheres to any official label certifying its family-friendly status, and a short overview on their positioning strategy based on the analysis of the hotel's official website in the order that the various explicitly targeted groups appear on the web page.

Table 1. Study participants

Participant	Role	Hotel description
A	hotel and sales director	• Average-size hotel located near a county seat in the Northern Hungary Region • Hotel does not have an explicit family-friendly label • Communication on website: family, events, couples, children
B	CEO	• Above-average-size hotel located in a county seat in the Southern Transdanubia Region • Communication on website: family, wellness, conferences
C	marketing director	• Above-average-size resort hotel located near a county seat in the Western Transdanubia Region • Communication on website: wellness, family-friendly, various child age groups
D	marketing and sales director	• Above-average-size resort hotel located near a county seat in the Central Transdanubia Region • Communication on website: child-friendly, baby-friendly, family-friendly, wellness, events
E	sales director	• Above-average-size resort hotel located in the Central Transdanubia Region, in the greater catchment area of the capital city • Communication on website: child-friendly, wellness, events
F	marketing manager	• Large hotel located in a spa town in the Western Transdanubia Region • Hotel does not have an explicit family-friendly label • Communication on website: child-friendly, wellness, conferences

Source: own edition

To capture the full range of insights, participants represented institutions of various sizes from all over the country, going from a ca. 30-room average-

size hotel to a 300+-room large hotel. The same way, some of the represented institutions explicitly adhered to various family-friendly labels, while others willingly did not.

Before each interview, the participants were briefly informed, via email, about its general purpose. After some introductory questions about the general trends in tourism, informants were asked – in a general manner – to describe what child-friendliness meant to them, and then, to their guests. Support questions – should the given topic not come up in the interviewee's free speech – included inquiring about conceptual differences between baby-, child- and family-friendliness, the way in which the concept was handled within the operations of the hotel, on their website as well as on social media and in online reviews. Interviews lasted between 60 and 90 minutes, with each one being digitally recorded and then transcribed verbatim for analysis.

Data analysis was conducted in three steps, as suggested by Miles et al. (2014): data condensation, data display, conclusion drawing/verification. During data condensation, the body of text was coded for emergent underlying dimensions, using NVivo 10 software, by two independent coders. The first two interviewers were coded separately using a first version of the codebook, then a session was organised to discuss differences in coding. At the end of the coding process, the authors once again met to finalise the results and to discuss their qualitative observations. In the following presentation of the results, individual quotes will be used to illustrate the findings.

Results of the study

What is a family vacation?

While previous studies showed a slight difference between the concepts of baby-, child-, and family-friendly accommodations (see e.g. Csordás et al. 2018b), no clear definition of any of them could be found in our sample as the perception of the various concepts differed greatly among our informants and, even during the interviews, the terms were often employed inconsistently: sometimes they were used as synonymous, while at other times, to emphasise a marked difference. Our analysis, therefore, will attempt to contrast and synthesise the underlying dimensions that were identified throughout the data condensation phase.

As McCabe (2015. 175) puts it, the "concept of family is something that everyone can instantly relate to as being identifiable and comprehensible […] yet

it is also confounding in its nebulousness and is subjectively constructed". While our sample did not bring up as unique segments as "professional aunts, no kids" (Camargo–Tamez 2015), according to our results, family vacation is still not a trivial matter.

For one, the fragmentation of the tourist market as a megatrend can also be seen from within the family target group. Segmenting the larger family target market into various sub-groups seems to become a notable instrument for hospitality establishments' capacity management.

Age, but also family structure can become meaningful variables in that. As formulated by one of our informants, "*families are manifold*" (C) and their description in our sample is equally heterogeneous. Various family types that came up during our interviews are: divorced parent, family with more than one child with a large age difference between children, mothers with their first infant, grandparents with grandchildren, etc. According to our informants, age does have an influence on consumer behaviour in terms of two aspects: for instance, when choosing babies "*as a target group, there is a presence during workdays as the targeted group is not linked to school [holidays]*" (A) making families with babies "*good travellers even during the [working] week*" (C). Also, "*preschoolers often arrive with grandparents even during the [working] week*" and, therefore, they might also be a target for special offers (E).

At the same time, family structure is also an important facet in this market: following the age of the child, family size is the second dimension involved in defining the audience, yet a more complex one as it entails a number of bottlenecks. As one of our informants put it, "*if they have three kids in three age groups, I should be able to entertain all three of them, even in a completely separate manner*" (B) (see also: Table 3/7). Similarly, a family with a first newborn poses a communication challenge during customer acquisition, as they are in an information vacuum about the possibilities offered to them, while families with more than one child are likely to have an own experience already. The same way, families turned out to be a more complex segment in terms of overall marketing communications, for example because it is a completely different communication niche to "*put a two-year-old onto the photo, and not a 12-year-old*" (A).

The continuum of family-friendliness

The most important result of the present study is that it establishes a continuum of family-friendliness and the difference – as ingeniously formulated

by one of our informants – that lies between the "*software*" and the "*hardware*" when it comes to being a family-friendly institution.

On the one hand, baby-friendly hotels require very special infrastructure that has to be taken into account from as early as the drawing board: if the hotel was not explicitly built to be baby-friendly (taking into account the specific needs of the target group in terms of logistics), then it is very hard for it to become one through subsequent reorganisation, not only because of the growing number of standards to live up to but also the physical constraints emerging from the layout of the building (i.e. "*hardware*") (Table 3/1-3). Physical environment features are those that can be most easily verified when organising a family trip. It is therefore not surprising that the industry certifications mentioned during the interviews focused essentially on this issue. Also, as mentioned in our literature review, previous studies in the field equally focused on family-friendliness dimensions, with many of them relating to the physical environment (see e.g. Habibah et al. 2015), which is an "*entry level that should be passed*" (D). Yet, in our sample, the physical elements are not necessarily related to the concept of family-friendliness, but rather to a subset thereof, namely small children. Most specific mentions came up either in connection with room size and furnishing (being able to accommodate babies) or with child entertainment spaces (playrooms and sports equipment). These dimensions were found to provide a minimum experiential level of family-friendliness, referred to as "dissatisfiers" in the management literature (see e.g. Khalifa 2004), elements that consumers implicitly expect when searching for family-friendly accommodation, elementary product requirements that every offer within the category should satisfy in order to be marketable: their existence does not lead to additional satisfaction, but their absence leads to customer dissatisfaction. Yet, family-friendliness should not be mistaken for this level of service. As our informants put it, "*if a client goes to a hotel that claims to be family-friendly, where family-friendliness only consists in* [various minimum criteria provided by our informants – see Table 2]*), then family-friendliness will mean that to them and these will be the call signs associated with it*" (C), leading to the formation of a pandemonium of first individual impressions about the concept on the demand side. Then, when they stay at another potentially better-suited accommodation, "*they are often surprised by the number of programmes that are provided*" (D) on the supply

side, yet, having gotten used to another (lesser) idea of the service, "*they will not be willing to pay more for another [level of] service that they perceive as the same*" (C). Thus, based on our interviews, there is a persistent need for establishing a common understanding of the family-friendliness concept.

Table 2. Dimensions of a perceived minimum level of "family-friendliness" for hotel guests

- "*… being able to get a crib for the baby for the night, or having three high chairs at most for babies at the restaurant, one of which they might snatch, or even maybe having a playroom with three baby tables where they can play with their child…*" (C)
- "*… having a very tiny playroom with six toys…*" (B)
- "*… having a playground, high chairs, etc. …*" (D)
- "*… having a potty and a high chair …*" (A)

Source: own research

Taking away the greater part of the physical constraints (e.g. children already having passed the sensory-motor stage of development), catering to the various needs and motivations of family members becomes the next primordial step in the evaluation of whether an institution is indeed family-friendly. Our informants corroborated the importance of children's needs and, thus, of child-friendliness (Table 3/4). Here, animation and entertainment were highlighted as the most important experience factors, which require a great deal of flexibility in operations and organisation (i.e. "*software*") from the host institution. This was conceptualised as a transitional stage between the physical environment and service offers, where the establishments first needed to be equipped with a number of facilities (the most often mentioned ones were: playrooms and playgrounds) where activities (such as animation, contests, thematic programmes) could be performed. These, however, also rely heavily upon the human factor, such as the staff and the overall management philosophy of the hotel, offering an on-the-spot experience to those who participate. A family-friendly hotel's management philosophy can manifest itself through actions like offering specific programme packages or thematic series of events, exacting and ensuring continuous training (Table 3/5), being up-to-date on the target group's expectations, and taking into account family dynamics (Table 3/8).

Table 3. The continuum of family-friendliness – Illustrative quotes

Dimension		Quote
"dissatisfiers" / "hardware"	[1]	"*Even before the hotel was built, since **as early as the blueprints**, the owners believed that families and kids were very important here*" (F)
	[2]	"*Our **'software'** that we developed for this can be considered the best in the country, but our **'hardware'**, it wasn't made for [a family-friendly hotel], so it needed some remodelling*" (E)
	[3]	"*Every corner of the hotel is designed to be suitable for families. The furniture is chosen accordingly, wall paint materials are chosen accordingly, plants in the garden are planted accordingly. […] Recently, we renovated our restaurant. But before that, **we examined** how families could eat more comfortably...*" (C)
"software" / operating philosophy	[4]	"*We needed to focus on what a child and a parent could expect. The **two must coincide, because the parent wants to see that their child is in good hands***" (E)
	[5]	"*At our place, being able to speak with the child, to understand what they want, to be able to prioritise the child's request, which comes first – that is **an absolute basic** [element of the] **training***." (C)
	[6]	"*We also strive to offer the possibility of leaving the child under the supervision of a [skilled kindergarten] teacher […] while parents go for a massage*"(E)
	[7]	"*Another challenge for family-friendly accommodations is to [ensure that] the various generations can **enjoy themselves, side by side, while being diverse***" (C)
	[8]	"*We also take the kids to lunch if the parent requests it […] but there is also this problem with parents, that [even if] we take their child, then mom **can't bear it not to watch** her kid from the corner*" (A)
"delighters"	[9]	"*Guests arrive with their children and leave them with qualified childcare workers to allow themselves three hours of free time, so they won't tolerate anybody else's child jumping up and down because that's the exact reason why they handed over their own kids, **to enjoy a little peace and quiet***" (C)
	[10]	"*All rooms are equipped with an inside and outside baby carriage, a changing table is **prepared in advance**, the wet wipe holder is heated – they **go to such lengths***" (D)

Note: authors' translation. Emphases added by the authors.

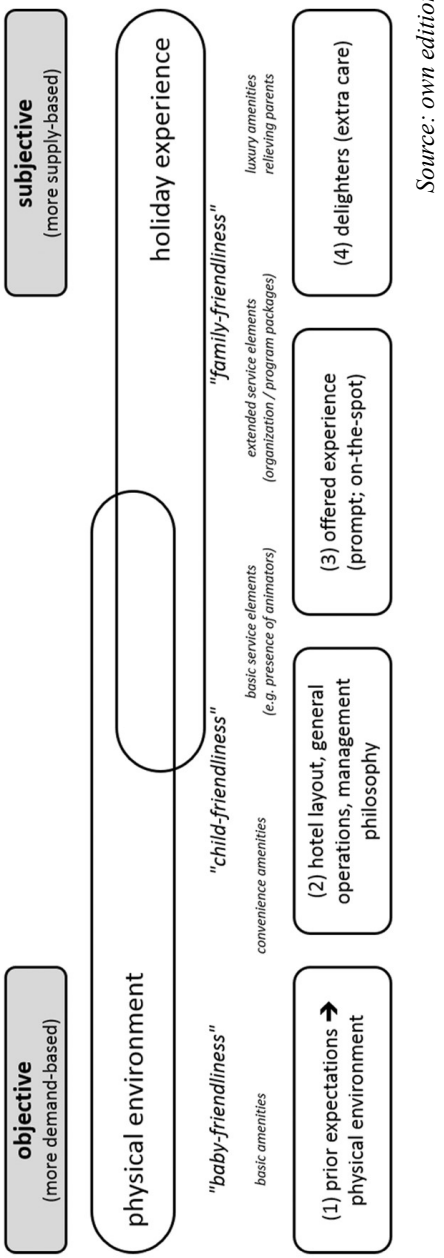
Source: own research

At the other end of the continuum, based on the interviews, family-friendliness is ultimately achieved when all family members are satisfied with the service they have received and, even more, they have benefited from unexpected advantages

that are referred to as "delighters" in the management literature (see e.g. Khalifa 2004). In the interviews, although some of the elements identified as delighters were, by their nature, related to the physical environment (Table 3/10), they could be deemed more as extra considerations and efforts made by the hotel –and, as such, unique selling points – pertaining to the larger category of operating philosophy and company practices and policies that contribute to a smooth family vacation. Indeed, as mentioned before, family holidays can be a source of stress for parents (Backer–Schänzel 2013) if they constantly have to entertain their children themselves to a point where too much family time becomes counterproductive (Mikkelsen–Blichfeldt 2015). In this regard, a truly family-friendly hotel might provide services not only to cater to the specific needs of children and keep them busy (e.g. playrooms, skilled animators, kiddie pools) but also to relieve some of the burden of parenthood from adults (e.g. employing professional nursery school teachers, setting up the playhouse next to the restaurant, separated only by a glass wall, in order for parents to be able to eat peacefully), peaking in offering adult-only services specifically for parents (e.g. adult-only spa section) and ultimately leading to a joyful and relaxed experience, where "*mom does not stress out and dad is left alone and can enjoy a beer on the balcony*" (D). This finding is in line with the results of Backer and Schänzel (2013) who, based on their study, affirm that institutions targeting family holidays primarily need to focus on relieving stress throughout their service offers. All in all, based upon our set of interviews, family-friendliness is a much more subjective concept than baby- and child-friendliness and it can be perceived as achieved when all family members – including parents – genuinely enjoy their stay and are able to relax. The above findings are summarised in Figure 1.

Holiday motivations

The conflicting motivations that make family holidays a challenge for service providers equally surfaced during the interviews. Mentions of activities such as animations were mostly related to children (Table 4/2), while adults were mostly mentioned as passive agents being present at these events as carers/supporters, with no interest in those activities (Table 4/1) or as active agents needing downtime and relaxation on their own (Table 3/9). Family-friendliness in this context relied on the ability of the hotel, through their operating philosophy and staff, to act as intermediaries or facilitators (Table 3/6). That way, parents can "outsource" (McCabe 2015. 178), more or less reluctantly (Table 3/8), some of their duties and entrust the service provider with part of their family leisure. In rising to the occasion, an interesting facet of our



Source: own edition

Figure 1. The continuum of family-friendliness

interviews was some of our interviewees' reference to their animation staff. Indeed, at least three of them emphasised – directly or indirectly – the professional status of their personnel. As such, instead of referring to them as "animators", they used very specific terms such as "pedagogue" (E), "professional animator" (F), "nursery school teacher" (F), "qualified nursery school teacher", "qualified child supervisor" (C). This is complemented by the fact that this specific workforce requires constant training, both psychological (to be able "*to talk to the child, to understand what they need*" (C)) and practical ("*we regularly have first aid training so that, if anything happens to the child, or even to the adult, our colleague can intervene*" (C)). Contradictorily, our interviews showed that, even if practitioners realised the importance of a professional staff, that did not (always) pertain to all human resources of the hotel: at most times, only to those interacting with children, that is, animators. Other employees, such as waiters (Table 4/6), receptionists or housekeeping staff, were not mentioned in the above context. One of our informants summarises this idea stating that "*a family-friendly operation is a rather labour-intensive matter, as the need in [manpower] is a lot different from a general hotel's and the latter also doesn't need to pay extra for [this specialized manpower]*" (C).

Most of our interviews show that the analysed family-friendly hotels realise that family-friendly positioning is cost- and labour-intensive, yet targeting this niche brings undeniable benefits. Two interesting exceptions to this observation were two half sentences, where the interviewee did not perceive baby-, child- or family-friendly services as a given, despite being the representative of a hotel that is expressly family-friendly ("*we have specifically equipped rooms [for babies] and we don't even ask more [money] for them*" (A)).

Can family-friendliness be standardised?

Few professional certification systems exist to guarantee both generations the experience of a joyful relaxation (Backer–Schänzel 2013). According to our informants, a legitimate certification should offer consistency and thus comparability to consumers (Table 4/5) in order to provide an effective solution to the issue of the numerous (and sometimes widely) differing consumer perceptions of the family-friendliness notion and, in the long run, to be able to educate the consumer and the market as a whole. On the market side, based on the interviews, this might not stem from a voluntary certification system initiated by a private company (Table 4/5), but rather from a centrally operated and/or coordinated body, such as a professional association or a government agency.

Table 4. Additional dimensions identified in the research – Illustrative quotes

activity vs. relaxation	[1]	"*We're also trying to involve the **adults** [with family programmes], but I must say, they **are very lazy***" (E)
	[2]	"*There is animation every day, no matter how many kids are in the house*" (E)
standards	[3]	"*There are around **100 criteria, mostly involving the infrastructure**. […] These criteria are very strict*." (E)
	[4]	"*If for us, as a hotel, with a certification like this, […] and one has to [comply with] **a long list** then [they see that] there are some things, developments that are overdue, they are a continuous [warning] for us to keep complying*." (A)
	[5]	"*When a private company takes it upon itself to begin certifying [hotels] from one day to another, it is not suited to offer a solid comparison of a whole [complex] market. […] this system may now have 21 hotels in it and I'm not sure, when I go to any of these 21 hotels, I'll be able to discover any **consistency** […] so it **still doesn't help the consumer***" (C)
standards–human factor	[6]	"*There is no such training specifically **for other staff**. […] Waiters **grew into the role** and **acknowledged** the fact that they had to cross the premises with their plates while having 3 kids running around them*."

Note: authors' translation. Emphases added by the authors.

Source: own research

As mentioned before, the foundations of family-friendliness were (as much in our sample as in other pieces of research) identified as being embedded in the physical environment, as the target group has specific logistical needs throughout their holidays. Nonetheless, as our interviews show, compliance with a "list" of purely infrastructural requirements (Table 4/3-4) will not necessarily make a hotel family-friendly; the above-mentioned service practices and operating philosophy are just as (if not more) important to fulfil the fundamental need for a family vacation, namely resting (Backer–Schänzel 2013; Csordás et al. 2018a).

Conclusion

The objective of this study was to explore stakeholder views within a specific segment of the hospitality industry, namely family-friendly hotels, as to their perceptions of the family-friendliness notion and related practicalities. Since a growing number of hotels claim to be family-friendly, in-depth expert interviews

contributed to offering topical knowledge and the latest developments in the field. As our informants confirmed, clients do not have a clear idea of the family-friendliness concept related to hotels. In addition, the interviews confirmed that a lot of the aforementioned hotels were more likely to use the term as a fad, while lacking the attitude, operating philosophy, and know-how to offer a genuinely family-friendly service. Thus, the findings indicate that, while fuzzy, family-friendliness is a dynamic concept from the side of the demand that can be moulded by leading market actors. Hence, the importance of consumer education also indirectly surfaced in our research.

Family-friendliness can be conceived for hotels as a unique selling proposition for targeting consumers, where quality assurance becomes a key marketing concept (Schänzel–Yeoman 2014). In the co-creation of value between the service provider and the consumer, however, a common understanding of the concept is primordial, all the more so as, even though professional certifications do exist, they are rarely used in the area. At the same time, while there is still a multitude of consumer understandings about what a family-friendly service offer should look like, not even online consumer reviews, otherwise at the centre of attention in the tourism industry, will be able to provide an authentic tool to assist consumers in their decision making.

A continuum of family-friendliness arose from our research, showing a connection between the tangible elements of physical evidence (hotel layout, facilities, equipment) that can be viewed in parallel with service dissatisfiers, and an establishment's operating philosophy, and company practices and policies that contribute to a smooth family vacation that can act as delighters and thus as unique emotional and selling points for hotels that aim to use the "family-friendly" label in their service offering.

References

Agate, J. R.–Zabriskie, R. B.–Agate, S. T.–Poff, R. 2009. Family Leisure Satisfaction and Satisfaction with Family Life. *Journal of Leisure Research* 41(2), 205–223.

Ásványi, K.–Markos-Kujbus, É. 2017. Családbarát szállodák a családok szemével. In: Bányai, E.–Lányi, B.–Törőcsik, M. (eds.) *Tükröződés, társtudományok, trendek, fogyasztás: Egyesület a Marketing Oktatásért és kutatásért (EMOK) 23. országos konferencia*. Pécs: Pécsi Tudományegyetem, 14–22.

Backer, E.–Schänzel, H. 2012. The Stress of the Family Holiday. In: Backer, E.–Yeoman, I.–Schänzel, H. (eds.) *Family Tourism - Multidisciplinary Perspectives*. Bristol: Channel View Publications, 105–124.

Backer, E.–Schänzel, H. 2013. Family Holidays - Vacation or Obli-cation? *Tourism Recreation Research* 38(2), 159–173.

Backer, E.–Yeoman, I.–Schänzel, H. 2012. Introduction: Families in Tourism Research. In: Backer, E.–Yeoman, I.–Schänzel, H. (eds.) *Family Tourism - Multidisciplinary Perspectives*. Bristol: Channel View Publications, 1–14.

Camargo, B.–Tamez, M. F. 2015. Professional Aunt, No Kids: An unexplored segment of family tourism. *e-Review of Tourism Research (eRTR)* 12(3/4).

Carr, N. 2006. A Comparison of Adolescents' and Parents' Holiday Motivations and Desires. *Tourism and Hospitality Research* 6(2), 129–142.

Carr, N. 2011. *Children's and families' holiday experience*. London: Routledge.

Cullingford, C. 1995. Children's attitudes to holidays overseas. *Tourism Management* 16(2), 121–127.

Csordás, T.–Markos-Kujbus, É.–Ásványi, K. 2018a. „A gyerekeim imádják, ezért én is imádom" – Családbarát hotelek fogyasztói percepciói online értékelések alapján. *Turizmus Bulletin* 18(1), 17–28.

Csordás, T.–Markos-Kujbus, É.–Ásványi, K. 2018b. "Where Rest Isn't a Power Hike" – Consumer Perception of Family-Friendliness of Hotels on Online Review Sites. In: Gounaris, S.–Alexandr, M.–Hamilton, K.–Karampela, M.–Lacka, E. (eds.) *Proceedings of the 47th EMAC Conference – People Make Marketing*, Glasgow: University of Strathclyde.

de Bloom, J.–Geurts, S. A. E.–Kompier, M. A. J. 2012. Effects of Short Vacations, Vacation Activities and Experiences on Employee Health and Well-Being. *Stress and Health* 28(4), 305–318.

Gardyn, R. 2001. The New Family Vacation. *American Demographics* 23(8), 43–47.

Gram, M. 2007. Children as co-decision makers in the family? The case of family holidays. *Young Consumers* 8(1), 19–28.

Guba, E. G.–Lincoln, Y. S. 2005. Paradigmatic controversies, contradictions, and emerging influences. In: Denzin, N. K.–Lincoln, Y. S. (eds.) *The Sage Handbook of Qualitative Research (3rd ed.)*. Thousand Oaks, CA: Sage, 191–215.

Habibah, A.–Hamzah, J.–Er, A. C.–Buang, A.–Mushrifah, I.–Selvadurai, S.–Nor Ghani, M. N. 2015. An Appraisal of Family-Friendly Tourism in Malaysia. *International Business Management* 9(6), 1523–1534.

Harms, B.–Bijmolt, T. H. A.–Hoekstra, J. C. 2017. Digital Native Advertising: Practitioner Perspectives and a Research Agenda. *Journal of Interactive Advertising* 17(2), 80–91.

Jackson, E. L. 2000. Will Research on Leisure Constraints Still Be Relevant in the Twenty-first Century? *Journal of Leisure Research* 32(1), 62–68.

Johns, N.–Gyimóthy, S. 2002. Mythologies of a theme park: An icon of modern family life. *Journal of Vacation Marketing* 8(4), 320–331.

Kang, S. K.–Hsu, C. H. C.–Wolfe, K. 2003. Family Traveler Segmentation by Vacation Decision-Making Patterns. *Journal of Hospitality & Tourism Research* 27(4), 448–469.

Kennedy-Eden, H.–Gretzel, U. 2016. Modern vacations–modern families: new meanings and structures of family vacations. *Annals of Leisure Research* 19(4), 461–478.

Khalifa, A. S. 2004. Customer Value: a review of recent literature and an integrative configuration. *Management Decision* 42(5), 645–666.

Lehto, X. Y.–Choi, S.–Lin, Y.-C.–MacDermid, S. M. 2009. Vacation and family functioning. *Annals of Tourism Research* 36(3), 459–479.

McCabe, S. 2015. Family leisure, opening a window on the meaning of family. *Annals of Leisure Research* 18(2), 175–179.

Mikkelsen, M. V.–Blichfeldt, B. S. 2015. 'We have not seen the kids for hours': The case of family holidays and free-range children. *Annals of Leisure Research* 18(2), 252–271.

Mikkelsen, M. V.–Blichfeldt, B. S. 2018. Grand parenting by the pool. *Young Consumers* 19(2), 127–140.

Miles, M. B.–Huberman, A. M.–Saldaña, J. 2014. *Qualitative Data Analysis (3rd ed.)*. Thousand Oaks, CA: Sage.

Murdock, G. P. 1949. *Social Structure*. New York, NY: Macmillan.

Peercy, M. A.–McCleary, K. W. 2010. The Impact of the Year-Round School Calendar on the Family Vacation: An Exploratory Case Study. *Journal of Hospitality & Tourism Research* 35(2), 147–170.

Sandelowski, M. 2008. Theoretical Saturation. In: Given, L. M. (ed.). *The Sage Encyclopedia of Qualitative Methods*. Thousand Oaks, CA: Sage, 875–876.

Schänzel, H. A.–Yeoman, I. 2014. The Future of Family Tourism. *Tourism Recreation Research* 39(3), 343-360.

Settersten, R. A.–Ottusch, T. M.–Schneider, B. 2015. Becoming Adult: Meanings of Markers to Adulthood. In: Scott, R. A.–Kosslyn, S. M. (eds.) *Emerging Trends in the Social and Behavioral Sciences*. Hoboken, NJ: John Wiley & Sons, 1–16.

Shaw, S. M.–Dawson, D. 2001. Purposive Leisure: Examining Parental Discourses on Family Activities. *Leisure Sciences* 23(4), 217–231.

Shaw, S. M.–Havitz, M. E.–Delemere, F. M. 2008. "I Decided to Invest in My Kids' Memories": Family Vacations, Memories, and the Social Construction of the Family. *Tourism Culture & Communication* 8(1), 13–26.

Sobh, R.–Perry, C. 2006. Research design and data analysis in realism research. *European Journal of Marketing* 40(11/12), 1194–1209.

Such, E. 2006. Leisure and Fatherhood in Dual-Earner Families. *Leisure Studies* 25(2), 185–199.

Truong, Y.–Simmons, G. 2010. Perceived intrusiveness in digital advertising: Strategic marketing implications. *Journal of Strategic Marketing* 18(3), 239–256.

Trussell, D. E.–Shaw, S. M. 2007. "Daddy's Gone and He'll Be Back in October": Farm Women's Experiences of Family Leisure. *Journal of Leisure Research* 39(2), 366–387.

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The impact of regulatory focus on decision-making

FERENC ZSIGRI[1]

The goal of this paper is to draw decision-makers' attention to the importance of regulatory focus theory (RFT) with a view to supporting their daily decision process. RFT divides people into two types based on the decision-making style they embrace in the face of risk: promotion-oriented (driven by prospective success) and prevention-oriented (propelled by the desire to avoid losses). Work teams have their own regulatory foci, which can be very different from team members' individual orientations and profoundly determine the group's attitude to risk. Regulatory focus has an impact on regulatory fit, risk attitude, sunk cost bias, framing, collective decisions, moral engagement and belonging, creativity as well as health and emotions. Decision-makers have to know their people's regulatory foci as well as their own in order to improve decision quality. They should know how they can temporarily replace chronic regulatory focus with an induced one in order to influence attitudes to risk (e.g. through time pressure, framing or mindful selection of team members).

Keywords: regulatory focus, regulatory fit, decision-making, ethics.
JEL code: M12.

Introduction

Prescriptive decision methods are still prevalent in organisational decision-making. Even if decision-makers regularly experience the shortcomings of these approaches, their exclusive use is widespread. These methods are often shaken by real-life circumstances. Vital input information is mostly incomplete and inaccurate. There are many black boxes in the process and results do not always meet the goals. We frequently do not fully understand why a seemingly sound decision yields a miserable aftermath. Nor is it unusual that we are surprised by the unexpected side effects of our choices. Behavioural decision-making theories offer explanations to many of these issues. One of these important theories is regulatory focus theory (RTF). This theory adds a lot of insight to why decisions under risk are made the way they are. It describes distinctly different risk attitudes. Beyond risk-taking styles, it also deals with performance, creativity, group dynamics, ethics, corporate identity – in relation to regulatory focus. It also explains how our emotions are influenced by our regulatory focus.

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The goal of this paper is to draw decision-makers' attention to the importance of regulatory focus theory (RFT) with a view to supporting their daily decision process. The article is based on a literature review. Only relevant peer reviewed scientific publications were processed, most of them with publication date of 2000 or later.

The concept of regulatory focus and regulatory fit

Regulatory focus theory (RFT) assumes that fundamentally different psychological needs make self-regulation operate in distinct ways. The two different *modi operandi* are promotion focus and prevention focus. Promotion-oriented persons are concerned with whether a positive outcome is present or absent – such as accomplishment, advancement or aspirations. In contrast to this, prevention-focused people are concerned with the presence or absence of negative outcomes – like protection (hazard), safety (unsafety) or responsibilities (aftermath) (Higgins 2002).

People have a natural gravitation to either prevention or promotion focus. This is called chronic regulatory focus. On the other hand, regulatory focus is fluid and can easily be shifted by circumstances. This is situational regulatory focus. Our preferred regulatory focus depends on our personality traits, on how our parents raised us and on our life experiences. National culture also has an impact (Hamilton 2016).

In general, we qualify a decision as good when it has a good outcome. By 'good outcome' we mean the one whose benefits are the highest while sacrifices are the lowest. Nonetheless, there is a remarkable degree of subjectivity in this grading. In reality, people will experience a decision as being truly good only if it fits their regulatory focus. Further, the more the means to a goal fit a person's regulatory focus, the more he/she will be motivated to reach the goal and the more highly he/she will value the outcomes. People will retrospectively evaluate their decision more positively if regulatory fit – in relation to the actual decision – is greater. Merchandise chosen with greater regulatory fit will also be valued more highly. Thus, regulatory fit equally influences the valence of the decision, of the goal pursuit and of the outcome (Higgins 2000).

People are more sensitive to situations, information, scenarios and prospects that match their regulatory foci. Promotion-oriented people are more responsive to gains and non-gains, while prevention-oriented individuals are more stimulated

by losses and non-losses. Regulatory focus will also determine the preferred goal pursuit strategy: promotion-oriented individuals will prefer eager means – immediate action, ideal outcomes, success. Prevention-oriented people will favour vigilance strategies – meticulous planning, considering worst-case scenarios, the exertion of efforts to avoid them. When people are forced to choose goals or means that do not fit their regulatory focus, regulatory misfit sets in. Under these poor fit conditions, performance is likely to deteriorate and the valence of the outcome also decays. The notion of regulatory fit has a profound impact not only on decision-making but also on how people can be efficiently persuaded or influenced (Hamilton 2016).

The relationship between regulatory focus and heuristics/biases

The impact of regulatory focus on risk attitude

Promotion orientation is characterised by eagerness. Promotion-oriented people will want to ensure hits (commission) and to avoid errors of omission (missing opportunities). This causes them to be positively biased to risk – they are prone to taking too much risk. In contrast, vigilant people want to avoid errors by commission (making mistakes), therefore they have a propensity for conservative bias – taking too little risk (Higgins 2002).

Decision-making under risk is an unalienable part of life. Regulatory orientation impacts risk perception and risk propensity. There are positive and negative risks in acting (commission) and in refraining from action (omission). In the past, theories that assumed the full rationality of decision-making under risk were dominant. It was anticipated that the only factor that drives humans in such situation is the maximisation of utility. Psychological aspects were entirely left out of scope. Actually, regulatory focus plays a crucial role in risky decision-making. More specifically, chronic regulatory focus determines risk propensity, while situational regulatory focus impacts risk perception. Hence, regulatory focus creates complex emotional responses to risk (Bryant–Dunford 2008).

People who believe in the elasticity of personality traits – incremental theorists – are essentially promotion-focused and more likely to choose riskier investments. In contrast, people who have faith in the permanence of personality traits will opt for risk-averse instruments (Rai–Lin 2019).

Promotion focus – both chronic and induced – is responsible for switching between risky and conservative decision-making strategies as regards gains.

Promotion-oriented individuals are likely to switch to a risk-seeking strategy when their stock portfolio remains unchanged for some time, but they switch to a conservative strategy when they have achieved significant gains. Prevention-oriented persons tend to always remain on the safe side. We can conclude that, while the perception of progress is crucial for promotion-oriented people when they are at a gain, safety always dominates the attitude of prevention-oriented people (Xi et al. 2014).

Risk-taking and rivalry are typical components of workplace life. The existence of rivalry triggers higher psychological arousal and a promotional mindset. Through these, it increases penchant for risk (To et al. 2018).

There is a relationship between prospect theory and regulatory focus theory. According to prospect theory, the perceived risk of losses is higher than the perceived chance of gains. In the face of risk, people tend to fear losses more than they desire gains. This is asymmetric discounting – discounting over uncertainty (DOU) – of losses and gains. Research shows that – in comparison with promotion-oriented persons – prevention-oriented people discount negative prospects more than positive prospects (Halamish et al. 2008).

Risk-diffusing operators (RDO) are actions aimed at risk reduction. They can be classified into two types: pre-event RDOs (to prevent the occurrence of negative events) and post-event RDOs (to lessen the impact of negative events once they have already occurred). Regulatory focus theory suggests that regulatory orientation – be it chronic or situational – determines whether a person is prone to choosing pre-event RDOs (fits prevention focus) over post-event RDOs or the other way around (fits promotion focus). There is no reliable connection between regulatory orientation and the choice of RDO options. However, researchers claim that RDO choice is dependent on the expected probability of detecting the occurrence of the negative event (Kirchler et al. 2010).

Relationship between regulatory focus and sunk cost bias

People are more likely to invest their resources to achieve a desired outcome if they have already sacrificed some on the same goal – in comparison with when they have not. This is sunk cost fallacy, which has a profound effect on our decisions and, thus, it is often responsible for the irrational increase of losses. Regulatory fit has a remarkable moderating role in sunk cost bias. In the case of a regulatory mismatch – the goal does not fit the decision-maker's regulatory orientation – the force of sunk cost bias is much weaker than in the case of regulatory fit. This is not

due to the value-from-fit effect but much more to the anticipation of regret: actors will foresee greater remorse if they fail on such a goal that was not even attractive to them at the outset (Kwak–Park 2012).

The case study on the 1996 Mount Everest disaster (McMullen–Kier 2016) provides the basis for additional research. That year, a never-before-seen high number of climbers died on the mountain. The fatalities involved separate climbing teams, independent from one another. The root causes of the tragedies were environmental factors – like sudden weather extremes – combined with flawed human decisions. The leaders were success-oriented people under great pressure to meet expectations. They were further misled by the deceptive proximity of the peak. Under these circumstances, they failed to perceive and to properly evaluate the signs of goal unattainability (exhausted team members, depleting oxygen tanks, inclement weather changes). They decided to continue the climb after the point of no-return instead of abandoning their goal and turning back into safety. The result: 12 unnecessary deaths. The messages – also supported by research outcomes – can be generalised. Promotion orientation shows very distinctive weaknesses. Such a mindset may make people commit to a goal before any cost-benefit or feasibility analysis is performed. They are also likely to skip any contingency planning; thus, no exit thresholds are defined either. They will be late in noticing the signs of an action crisis. They do not have an exit strategy. When things turn hard, they will be inclined to indefinitely escalate commitment even if this dooms them to further losses and finally – due to their inability to disengage – culminates in a serious failure. This is a grave trap of the entrepreneurial mindset.

Regulatory focus also impacts how people behave in the case of misplaced investments. There is a link between regulatory focus and the propensity to over-escalate commitment. Oftentimes, people irrationally raise commitment to futile endeavours. Loss aversion, blindness to alternative routes and reluctance to admit faults are the principal causes of sunk cost fallacy. Prevention-oriented people – rather than promotion-oriented people – are more likely to fall into this trap. This delusion may be healed by inspiring a situational promotion focus via inducing less motivation for safety and more motivation for progress. This mental state will inhibit the vain escalation of commitment. On another note, the hasty reduction of commitment has its own hazards, since it may encourage premature disengagement even if the goal would otherwise be accomplishable (Molden–Chin 2011).

Framing induces situational regulatory focus

Information framing has an impact on regulatory focus. If we manipulate the subjects' chronic regulatory focus through information framing, that may induce situational regulatory focus. This influences the subjects' choice between risky stocks and safe fixed deposits. The congruence between the message (text) and the image (picture) has a great impact on situational regulatory choice. Text-image combinations radiating success cause promotion-oriented decisions – choosing stocks instead of safer options. Sending safety messages results in prevention orientation – choosing fixed deposits (Ewe et al. 2018).

Clinical inertia is the failure to carry out an indicated medical treatment, which results in the suboptimal treatment of patients who suffer from chronic diseases. Its causes can be found on the side of the patient as well as on the side of the service provider. Provider-side flaws are related to the provider's regulatory focus: excessively prevention-oriented providers are prone to erring by omission and thus cause clinical inertia themselves. There are two possible solutions to this issue: either to override the provider's chronic regulatory orientation by creating a situational regulatory orientation or to frame the task so as to better fit the provider's chronic regulatory focus (Veazie–Qian 2011).

Groups have their own regulatory foci which influence their decision-making

Group decisions are oftentimes suboptimal. A core reason for this is that groups fail to properly process all relevant information and integrate it into their decisions. Group information processing should be interpreted as a motivational process that is connected to group goals. A study examined the effects of regulatory foci on the quality of group decisions and information processing. Like individuals, groups also have their own regulatory foci which fundamentally influence the operation of the group. Promotion-oriented groups are superior to prevention-oriented ones in terms of decision quality. The main way in which group regulatory orientation impacts group decisions is that it determines group information processing. The difference between the two attitudes (promotion vs. prevention orientation) lies not in the quantity of the information processed but rather in its quality: promotion-oriented groups tend to process more task-relevant information and thus they are in a position to make better decisions (Burtscher–Meyer 2014).

As regards induced regulatory focus and time pressure, individual decisions are different from group decisions. Groups need time to discuss and create their

shared goals as well as to establish their shared regulatory foci. When there is not enough time, all groups – whether they embrace promotion-oriented or prevention-oriented individuals – tend to be risk-averse and make safer decisions. When there is a sufficient amount of time, promotion-oriented groups will gravitate to riskier options. Thus, groups can be forced to be risk-averse by exerting time pressure or by inducing situational prevention group focus (Florack–Hartmann 2007).

This is in consonance with Kurt Lewin's observations of how time pressure influences leadership style: lack of time induces an authoritarian management style, while a sufficient amount of time facilitates more democratic styles (Gastil 1994).

Regulatory focus theory can explain and predict individual decisions in an interdependent economic decision framework – i.e. situations where several individuals are mutually influenced by one another's decisions. In such scenarios, prevention-oriented people are concerned with social status and safety and will concentrate on relative economic outcomes. In contrast, promotion-oriented decision-makers will be motivated by maximising opportunities and will focus on absolute outcomes (Gu et al. 2013).

Regulatory orientation has an influence on majority rule-based decision frameworks – i.e. when a decision-maker decides to choose (out of a binary, weak-dominant, multi-attribute set) the alternative supported by more than half of the people involved. Decision-makers are more likely to evoke this method when they are in prevention mode rather than promotion mode or when they prefer interdependent self-construal to independent self-construal. They spotlight a dynamic link between individual differences of goal pursuit motivation and self-construal. (Yong–Nieznański 2017).

High status provides control over others but it also means responsibility for the attainment of collective goals. The nature of these collective goals is influenced by the current status of the group. High-power decision-makers are more prone to showing promotion-oriented behaviour in low-status groups, while their counterparts in high-status communities will be prevention-oriented. Hence, there is a relationship between inter-group comparisons and intra-group dynamics (Scheepers et al. 2013).

Regulatory focus influences team decision-making in a new product launch context. In a study, some test teams were formed with high regulatory fit among members' orientation and also other teams in which there was a clear regulatory

mismatch among team members. The findings are twofold. Teams with a unanimous collective promotion regulatory focus – versus prevention-focused groups – were quicker to release new products, they developed more new products and their products were more innovative in the test environment. The other critical message of this experiment is that teams with a perfect regulatory match – be it promotion or prevention – do not follow top management instructions. They rather tend to work autonomously in a quasi 'island mode'. In contrast, teams with a regulatory mismatch among its members are likely to wait for and stick to top management instructions (Spanjol et al. 2011).

Another study examined the operation of two-member groups (dyads) in the face of strategic change. Groups with a unanimous promotion focus were more in favour of strategic change in comparison with prevention-oriented teams. Their penchant for novelty was independent of the preliminary instructions they were given. Again, forming teams with a regulatory focus mismatch among participants changed everything. Such heterogeneous teams were much more inclined to follow the guidelines provided to them beforehand (Spanjol–Tam 2010).

Relationship between regulatory focus and moral engagement/belonging

Regulatory focus has an effect on ethical behaviour. In a study, risk-induced situational promotion focus caused subjects to behave more extremely. They crossed the boundaries of ethical behaviour more often, but on other occasions they were more honest – compared to prevention-oriented people. This is also evidence of compensatory ethics – unethical deeds cause bad conscience which, in turn, wants to be healed by subsequent same-scale virtuous deeds. Thus, influencing regulatory focus in group settings impacts ethical behaviour by altering goal pursuit strategies (Gino–Margolis 2011).

Employees' engagement in an Unethical Pro-Organisational Behaviour (UPB) is a dangerous matter. The employees who decide to act dishonestly for the sake of their organisation can involuntarily inflict inestimable damages. There is a link between UPB and management style, framing and regulatory focus. Charismatic, inspirational, transformational leaders are likely to generate promotion focus which may lead to UPB among their followers (Graham et al. 2015).

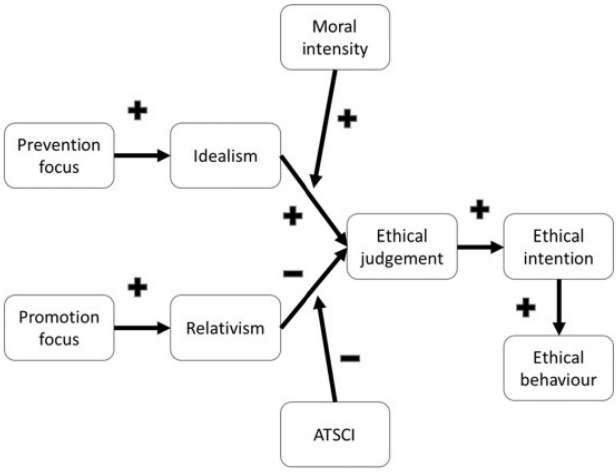
By their own moral decisions, consumers profoundly influence the morality of the marketplace. There are two alternatives regarding moral decisions. Moral balancing: the decision-maker deviates, in the morality of his/her decisions,

in a way that results in an 'acceptable' average of pluses and minuses. Moral consistency: the repetition of past moral or immoral decisions. The balancing effect is typical of people with a strong promotion focus, whereas the consistent repetition of moral or immoral decisions characterises prevention-oriented people (Schwabe et al. 2018).

Prevention-oriented individuals – with a chronic or situational focus – stick to the status quo. Once they have made a decision in a certain situation, they will use that as a reference for future similar situations – regardless of whether the aforementioned decision was ethical or not. Prevention focus predicted repetition as regards being dishonest by commission as well as by omission – even if being actively unethical caused worse feelings in prevention-focused individuals than being passively unethical. This shows the motivational dominance of regulatory fit over ethical or hedonic motives. Thus, the first decisions are highly important in the case of prevention-oriented people, since – through the prevention-repetition link – they are likely to perpetuate a certain kind of behaviour – even an unethical one (Zhang et al. 2014).

Green consumer behaviour (endeavour to minimise the harm caused to our environment) is also related to regulatory focus. Prevention focus positively generates ethical idealism – decisions are measured against an absolute scale of ethics, regardless of the deeds of others – whereas promotion focus stimulates ethical relativism – morality is judged relative to others' acts. Ethical idealism has a positive influence on green behaviour. In other words, prevention-oriented consumers are more likely to show green behaviour. However, this effect is moderated by the actor's Attention to Social Comparison Information (ATSCI). When ATSCI on green behaviour is high, people are likely to follow green behaviour even if they are promotion-oriented. Reversely, they are less likely to show green behaviour when ATSCI is low (see Figure 1). In other terms, regardless of our disposition, we are likely to follow a good example when we see it a lot (Zou–Chan 2019).

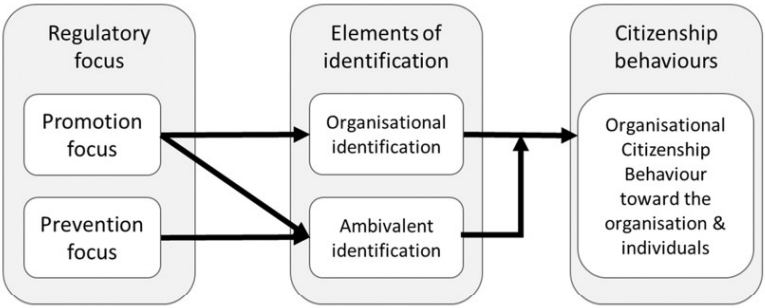
From a purely ethical point of view, individuals' ethical standing is determined by two independent dimensions: relativism and idealism. These yield four types of ethical ideology: situationists (relativism: high, idealism: high), absolutists (relativism: low, idealism: high), subjectivists (relativism: high, idealism: low) and exceptionists (relativism: low, idealism: low) (Forsyth 1980).



Source: Zou–Chan 2019

Figure 1. The impact of regulatory focus on ethical behaviour

Employees' identification with their employers is an ever-prominent issue – the phenomenon which is often referred to as 'Organisational Citizenship Behaviour (OCB)'. Such identification is an elaborate phenomenon and often embraces clashing stimuli and ambivalence (see Figure 2). Ambivalent identification means that an employee can identify with some of the employer's attributes while disliking other attributes. Promotion-oriented employees are governed more by attributes that they are fond of. In contrast, prevention-oriented colleagues are more sensitive to attributes they dislike (Schuh et al. 2016).



Source: Schuh et al. 2016

Figure 2. Hypothesised model linking regulatory focus, elements of identification and citizenship behaviour

The impact of regulatory focus on creativity

Beyond making us more risk-seeking and more flexible, regulatory orientation also shapes our creativity – in a compound way. Regulatory focus impacts creativity differently in the idea generation phase and the idea evaluation phase. Its effect also depends on the nature of the actual idea. Promotion-oriented people can generate more creative ideas in the generation phase and can better assess originality in the evaluation phase. Prevention-oriented individuals are better at evaluating quality – assessing the idea against specific criteria – and revealing errors. Promotion-oriented people are prone to being blind to obstacles or concerns (Herman–Reiter-Palmon 2011).

When people are promotion-focused, they concentrate on aspirations, while prevention-oriented individuals are more likely to focus upon responsibility. The effects of this theory on sport decision-making have also been studied. Promotion-oriented football players – like Lionel Messi – are better at making sport-specific divergent decisions when playing, and this ability fosters success. It is possible to induce and enforce promotion orientation which has good effects on the creativity of players on the field (Memmert et al. 2013).

The impact of regulatory focus on management issues

Staffing decisions are supposed to aim at hiring the best applicants. However, the reality is very different. Human resources staff is much keener on avoiding bad hires than finding stars. Thus, recruiters strive to minimise the chance of later regret – and, even more importantly, to avoid blame. Prevention orientation is prevalent in the recruitment process. The evaluation of applicants' information is therefore biased: negative information is considered more important. Company culture and management style have a major impact on this. A blaming culture further enhances the prevention orientation of the recruitment process (Kuhn 2015).

An examination of football players' performance expectations in relation to regulatory foci gave interesting results, too (Hüttermann et al. 2018). Players with a promotion-oriented regulatory focus are significantly more creative when seeking solutions in football game simulations. Nevertheless, these players have lower preliminary performance expectations regarding the quality of their proposed solutions in the simulation.

Another study (Lee et al. 2017) focused on expatriates' cross-cultural adjustment in their host countries. Many expats feel that host cultures are unfamiliar and difficult to adjust to. While prevention focus does not predict the

ability to adjust, promotion focus has a clear negative impact. Aggressive expats are likely to fail due to obstacles they generate for themselves. Persistent and prudent expats have a better chance to succeed.

Contentment is commonly thought to be the typical hindrance for strategic change. Regulatory focus theory offers another explanation. Elongated competitive success makes managers cautious. They feel responsible for maintaining the momentarily favourable status quo and take up a defensive attitude – prevention orientation. In such cases, attributing strategic inertia to complacency will yield incorrect reactions. We must understand that the core motive behind managers' resistance to strategic change in such cases is not complacency but the defence of the precious status quo. Forcing managers will even make things worse: it further fortifies their prevention orientation (Rusetski–Lim 2011).

Upper echelon management's ability to sway from the enterprise's ongoing strategy may be imperative for organisational success. Promotion-oriented managers are more ready to do this. Management's regulatory focus is related to performance ambitions, firm maturity and permanence of the environment (Roundy et al. 2016).

Executive cognition is an antecedent of strategic action. Cognition is profoundly affected by regulatory focus, which determines whether a manager envisions the future as a world of threats or as a bonanza of opportunities. An executive's attitude can be measured on two axes: regulatory focus (prevention, promotion) and optimism (high, low). The two axes give us four possible categories: pioneering, pushing, protective and provocative. Executives in each category are characterised by very distinct cognitive attitudes (Phadnis et al. 2017).

There is much disparity between how people make decisions for their own sakes and for others'. When people decide for themselves they prefer to be prevention-focused – precautious. Conversely, when they agent for someone else – e.g. an employer – their regulatory focus bends toward promotion orientation – risk-seeker. There is also evidence of a perverse phenomenon: the reversion of the choice overload effect. When people select from too big a variety of options, they normally experience choice fatigue: the more alternatives, the lesser the ex-post happiness with the choice made. In a study, this was true only when participants made choices for themselves. When they chose for others, the choice overload effect reversed: the more options to choose from, the bigger the ex-post happiness (Polman 2012).

Regulatory focus impacts our attitude to deadlines. Promotion-oriented people think of deadlines as descriptions of goals to achieve (concern with

outcome). Prevention-oriented people recall deadlines as dates and as behaviours required to meet expectations (concern with process). Promotion-oriented people generate more positive fantasies (ungrounded expectations) relating to the outcome. They process deadline descriptions more thoroughly. Prevention-oriented people generate more positive (grounded) expectations. They pay more attention to deadline-related behaviour (Woltin–Jonas 2012).

Relationship between regulatory focus and individual health/emotions

A decision-making experiment was performed, comparing two different selection methods (Bhargave et al. 2015): one-stage choice (when decision-makers choose one option from a long list of different options in a single round) and two-stage choice, with the same list of options (decision-makers make a shortlist of options in the first round and select one option from the shortlist in the second round). In principle, the final choice should be identical, since they use the same initial full list of options in both cases. And yet, the two methods result in different final choices. The two-stage choice method increases preference for hedonism. This is caused by the effect of regulatory focus. Having eliminated the least attractive options in the first round, people felt that they had been preventive enough and thus they allowed themselves to be hedonistic in the second round. We can conclude that the method of decision-making may induce regulatory focus.

Promotion-oriented people tend to rank higher on the happiness scale in comparison with prevention-oriented people. Promotion-focused individuals look upon the status quo only as a reference point to be surpassed, present rules to be altered, and they strive to maximise psychological value. The two groups process the same situation differently, which makes their subjective level of happiness diverse (He et al. 2014).

Regulatory focus also influences the willingness for vaccination. Prevention-oriented people worry about their health more. They are more willing to undergo vaccination because of their anticipated regret for possibly getting sick due to omitting vaccination. When vaccination is framed – the efficiency and the benefits of the vaccine are properly explained to patients – the difference between the two regulatory foci vanishes (Leder et al. 2015).

When people make decisions, they generally anticipate their future emotions regarding the option they are about to choose. The regulatory fit of the decision – to the decision-maker's orientation – has a remarkable impact on these projections. Pursuing the wrong kind of means – eagerness means and

not sufficiently promotion-oriented means for prevention-oriented people or vigilance means and not properly vigilant means for promotion-oriented people – can cause poor fit. Imagining a positive outcome enhances promotion orientation and reduces prevention orientation – and vice versa. There is higher regulatory fit for promotion-oriented people in the case of positive outcomes and, in contrast, there is higher regulatory fit for prevention-oriented people in the case of negative outcomes. The higher the regulatory fit, the more positive people will feel about desirable choices and the more negative they will feel about undesirable choices. People evaluate their decisions retrospectively, too. The effect of fit is similar: decisions that have been made with good fit are valued higher and decisions made with poor fit are valued lower (Higgins 2002).

Both chronic and situational regulatory foci have a moderating effect on anticipated emotions related to decision-making. Anticipated agitation causes more positive action appraisal under prevention-oriented foci, whereas expected dejection results in more positive assessment under promotion-oriented foci (Leone et al. 2005).

Anticipated regret and guilt play a mediating role between prevention focus and omission bias. Omission bias is a mental flaw that makes some people more willing to accept the negative aftermath of their actions than that caused by inaction. Only prevention-oriented people are significantly affected by omission bias in relation to moral judgment (Chung et al. 2014).

Affect heuristics are mental shortcuts which are directed by momentary emotions. Promotion-oriented individuals rely on affect heuristics more than prevention-oriented people. They value emotion-based inputs higher when they make decisions in areas like person impression formation, product assessment or social recommendations. Their predisposition towards affective information is not due to peripheral vision. They simply find this kind of information more meaningful (Pham–Avnet 2009).

Promotion-oriented decision-makers value promotion-relevant outcomes more highly (outcome value). Their appreciation is even bigger if the preliminary goal setting was eager enough (means value). Prevention-oriented decision-makers prefer goals that are reached with carefulness and diligence. Thus, the fit between the goal, the means and the decision-maker's regulatory focus enhances the subjective value of goal attainment – this is the value from fit. In the absence of positive outcomes, decision-makers will evaluate the decision process itself. They will have fewer regrets if the decision has been made in concert with their

regulatory preferences – sufficient eagerness in the case of promotion orientation, caution in the case of prevention orientation (Higgins 2002).

Conclusions

This paper has discussed the regulatory focus theory (RTF) based on a literature review. The goal of this review has been to distillate recent literature into important messages for decision-makers: ideas that may improve daily decision-making. People can be divided into two groups based on their regulatory foci: prevention-oriented and promotion-oriented. While promotion-oriented people are motivated by the will to reach desirable outcomes, prevention-oriented people are propelled by the urge to avoid undesirable outcomes. This seemingly minor discrepancy between the two personality types results in many crucial differences in their goal setting and goal pursuit. The extent to which the given goal, the outcome of the decision and the means to it match the decision-maker's regulatory focus is called regulatory fit. Good fit makes goal setting and pursuit easier and the desirable outcome will make the decision-maker more content. Not only individuals but also human groups have their regulatory foci. Regulatory focus influences attitude to risk, to sunk cost bias, to affect heuristics, reactions to different framing effects and the level of creativity. It puts forward a series of management issues for consideration. Last but not least, it has an impact on our happiness and emotions. Table 1 shows multiple dimensions of comparison between promotion-oriented and prevention-oriented people.

Table 1. Comparison of promotion-orientation vs prevention-orientation

Dimension	Promotion-orientation	Prevention-orientation
Core motive	Progress	Safety
Strategy	Approach	Avoid
Role of status quo	Surpass	Maintain
Reason for over-commitment	Goal proximity bias	Sunk cost bias
Regulatory fit	Eagerness	Diligence
Ethics	Relativism	Idealism
Creativity	More	Less
Happiness	Greater	Lower
Planning	Less	More
Risk	Seeker	Evader
Coping with uncertainty	Avoid error by omission	Avoid error by commission

Source: own edition

This article allows us to develop important takeaways for leaders. Firstly, we have to bear in mind the main differences in motives in the case of prevention-oriented people versus promotion-oriented people. Different motives will make the two types lean towards different decisions in identical situations. Certain kinds of situations may require different orientations. Leaders must select the right person for the right task in order to avoid too much or too little risk-taking. We cannot expect our people to operate exceptionally well in a situational misfit. They are likely to operate best and most effortlessly when there is a match between their own orientation and the current situation. Besides, we have to understand our own orientation. When we make decisions, we have to calculate with asymmetrical forces – generated by our own orientation – so that we can make better-balanced decisions. When we consider pre-decision reasoning, we have to realise that it may be overly distorted towards risk or towards safety; thus, we have a chance to balance out these distortions and make the right choice. Secondly, groups have their own collective regulatory foci which can be very different from individual foci. The more homogenous the group, the more autonomous it will be. Heterogeneous groups are easier to control – but, on the downside, they will require more control. We have to be careful when forming teams in order to create the proper collective regulatory focus required by the given situation.

Thirdly, we should understand that we can temporarily alter chronic orientation – e.g. by framing the task or through time pressure so that our people can perform better in situations that would otherwise be a clear misfit to their chronic regulatory focus.

Regulatory focus is one of the cardinal theories on decision-making since it explains a lot of our behaviour in decision-making situations. If we know our regulatory orientation, we are more likely to better manage our decision-making. If we are aware of the others' attitudes, we are in a position to better understand their motives and predict their behaviour.

Limitations

Human decision-making is a very complex process that is influenced by many factors. There is a lot that has already been discovered and there might be even more to explore. Firstly, this publication has taken a purely behavioural descriptive approach to this issue. It does not deal with prescriptive (normative) theories, which provide other fundamental views on this topic. Secondly, due to the compound nature of human behaviour, descriptive theories cannot be

unambiguously systemised and integrated into a school of theories. Hence, the logical structure of this article could be altered entirely – and still give a valid, but distinct picture of the impact of regulatory focus on decision-making.

References

Bhargave, R.–Chakravarti, A.–Guha, A. 2015. Two-stage decisions increase preference for hedonic options. *Organizational Behavior & Human Decision Processes* 130**,** 123–135.

Bryant, P.–Dunford, R. 2008. The Influence of Regulatory Focus on Risky Decision-Making. *Applied Psychology: An International Review* 57(2)**,** 335–359.

Burtscher, M. J.–Meyer, B. 2014. Promoting good decisions: How regulatory focus affects group information processing and decision-making. *Group Processes & Intergroup Relations* 17(5)**,** 663–681.

Chung, E. K.–Kim, S. J.–Sohn, Y. W. 2014. Regulatory focus as a predictor of omission bias in moral judgment: Mediating role of anticipated regrets. *Asian Journal of Social Psychology* 17(4)**,** 302–311.

Ewe, S. Y.–Gul, F. A.–Lee, C. K .C.–Yang, C. Y. 2018. The Role of Regulatory Focus and Information in Investment Choice: Some Evidence Using Visual Cues to Frame Regulatory Focus. *Journal of Behavioral Finance* 19(1)**,** 89–100.

Florack, A.–Hartmann, J. 2007. Regulatory focus and investment decisions in small groups. *Journal of Experimental Social Psychology* 43(4)**,** 626–632.

Forsyth, D. R. 1980. A Taxonomy of Ethical Ideologies. *Journal of Personality and Social Psychology* 39(1)**,** 175–184.

Gastil, J. 1994. A Definition and Illustration of Democratic Leadership. *Human Relations* 47(8)**,** 953–975.

Gino, F.–Margolis, J. D. 2011. Bringing ethics into focus: How regulatory focus and risk preferences influence (Un)ethical behavior. *Organizational Behavior & Human Decision Processes* 115(2)**,** 145–156.

Graham, K.–Ziegert, J.–Capitano, J. 2015. The Effect of Leadership Style, Framing, and Promotion Regulatory Focus on Unethical Pro-Organizational Behavior. *Journal of Business Ethics* 126(3)**,** 423–436.

Gu, J.–Bohns, V. K.–Leonardelli, G. J. 2013. Regulatory focus and interdependent economic decision-making. *Journal of Experimental Social Psychology* 49(4)**,** 692–698.

Halamish, V.–Liberman, N.–Higgins, E. T.–Idson, L. C. 2008. Regulatory focus effects on discounting over uncertainty for losses vs. gains. *Journal of Economic Psychology* 29(5)**,** 654–666.

Hamilton, R. 2016. *How You Decide - The Science of Human Decision Making.* Chantilly, VA: The Teaching Company.

He, F.–Guan, H.–Kong, Y.–Cao, R.–Peng, J. 2014. Some Individual Differences Influencing the Propensity to Happiness: Insights from Behavioral Economics. *Social Indicators Research* 119(2)**,** 897–908.

Herman, A.–Reiter-Palmon, R. 2011. The Effect of Regulatory Focus on Idea Generation and Idea Evaluation. *Psychology of Aesthetics, Creativity & the Arts* 5(1), 13–20.

Higgins, E. T. 2000. Making a Good Decision: Value From Fit. *American Psychologist* 55(11), 1217–1230.

Higgins, E. T. 2002. How Self-Regulation Creates Distinct Values: The Case of Promotion and Prevention Decision Making. *Journal of Consumer Psychology* 12(3), 177–191.

Hüttermann, S.–Nerb, J.–Memmert, D. 2018. The role of regulatory focus and expectation on creative decision making. *Human Movement Science* 62(1), 169–175.

Kirchler, E.–Hoelzl, E.–Huber, O. 2010. Risk-defusing in decisions by probability of detection of harm and promotion and prevention focus. *Journal of Socio-Economics* 39(5), 595–600.

Kuhn, K. M. 2015. Selecting the Good vs. Rejecting the Bad: Regulatory Focus Effects on Staffing Decision Making. *Human Resource Management* 54(1), 131–150.

Kwak, J.–Park, J. 2012. Effects of a regulatory match in sunk-cost effects: A mediating role of anticipated regret. *Marketing Letters* 23(1), 209–222.

Leder, S.–Florack, A.–Keller, J. 2015. Self-regulation and protective health behaviour: How regulatory focus and anticipated regret are related to vaccination decisions. *Psychology & Health* 30(2), 165–188.

Lee, C. H.–Hung, C. C.–Chien, C. S.–Zhuang, W. L.–Hsu, C. Y. 2017. Regulatory foci and expatriate adjustment. *Personnel Review* 46(3), 512–525.

Leone, L.–Perugini, M.–Bagozzi, R. P. 2005. Emotions and decision making: Regulatory focus moderates the influence of anticipated emotions on action evaluations. *Cognition & Emotion* 19(8), 1175–1198.

McMullen, J. S.–Kier, A. S. 2016. Trapped by the entrepreneurial mindset: Opportunity seeking and escalation of commitment in the Mount Everest disaster. *Journal of Business Venturing* 31(6), 663–686.

Memmert, D.–Hüttermann, S.–Orliczek, J. 2013. Decide like Lionel Messi! The impact of regulatory focus on divergent thinking in sports. *Journal of Applied Social Psychology* 43(10), 2163–2167.

Molden, D. C.–Chin, M. H. 2011. Promoting De-Escalation of Commitment: A Regulatory-Focus Perspective on Sunk Costs. *Psychological Science* 22(1), 8–12.

Phadnis, S. S.–Sheffi, Y.–Caplice, C.–Singh, M. 2017. Strategic Cognition of Operations Executives. *Production & Operations Management* 26(12), 2323–2337.

Pham, M. T.–Avnet, T. 2009. Contingent reliance on the affect heuristic as a function of regulatory focus. *Organizational Behavior & Human Decision Processes* 108(2), 267–278.

Polman, E. 2012. Effects of Self-Other Decision Making on Regulatory Focus and Choice Overload. *Journal of Personality & Social Psychology* 102(5), 980–993.

Rai, D.–Lin, C. W. 2019. The influence of implicit self-theories on consumer financial decision making. *Journal of Business Research* 95(1), 316–325.

Roundy, P. T.–Dai, Y.–Bayer, M. A.–Byun, G. 2016. Motivated to change? TMT regulatory focus and strategic change. *Management Research Review* 39(7)**,** 803–829.

Rusetski, A.–Lim, L. S. 2011. Not complacent but scared: another look at the causes of strategic inertia among successful firms from a regulatory focus perspective. *Journal of Strategic Marketing* 19(6)**,** 501–516.

Scheepers, D.–Ellemers, N.–Sassenberg, K. 2013. Power in group contexts: The influence of group status on promotion and prevention decision making. *British Journal of Social Psychology* 52(2)**,** 238–254.

Schuh, S. C.–Van Quaquebeke, N.–Göritz, A. S.–Xin, K. R.–De Cremer, D.–van Dick, R. 2016. Mixed feelings, mixed blessing? How ambivalence in organizational identification relates to employees' regulatory focus and citizenship behaviors. *Human Relations* 69(12)**,** 2224–2249.

Schwabe, M.–Dose, D. B.–Walsh, G. 2018. Every Saint has a Past, and Every Sinner has a Future: Influences of Regulatory Focus on Consumers' Moral Self-Regulation. *Journal of Consumer Psychology* 28(2)**,** 234–252.

Spanjol, J.–Tam, L. 2010. To Change or Not To Change: How Regulatory Focus Affects Change in Dyadic Decision-Making. *Creativity & Innovation Management* 19(4)**,** 346–363.

Spanjol, J.–Tam, L.–Qualls, W. J.–Bohlmann, J. D. 2011. New Product Team Decision Making: Regulatory Focus Effects on Number, Type, and Timing Decisions. *Journal of Product Innovation Management* 28(5)**,** 623–640.

To, C.–Kilduff, G. J.–Ordoñez, L.–Schweitzer, M. E. 2018. Going for it on Fourth Down: Rivalry Increases Risk Taking, Physiological Arousal, and Promotion Focus. *Academy of Management Journal* 61(4)**,** 1281–1306.

Veazie, P. J.–Qian, F. 2011. A role for regulatory focus in explaining and combating clinical inertia. *Journal of Evaluation in Clinical Practice* 17(6)**,** 1147–1152.

Woltin, K. A.–Jonas, K. J. 2012. Thinking deadline: The impact of regulatory focus on deadline descriptions and deadline behavior. *European Journal of Social Psychology* 42(3)**,** 318–326.

Xi, Z.–Scholer, A. A.–Higgins, E. T. 2014. In Pursuit of Progress: Promotion Motivation and Risk Preference in the Domain of Gains. *Journal of Personality & Social Psychology* 106(2)**,** 183–201.

Yong, L.–Nieznański, M. 2017. Regulatory Focus and Self-Construal as Determinants of the Majority Rule in Individual Decision Making. *Studia Psychologica* 59(4)**,** 280–294.

Zhang, S.–Cornwell, J. F. M.–Higgins, E. T. 2014. Repeating the Past: Prevention Focus Motivates Repetition, Even for Unethical Decisions. *Psychological Science* 25(1)**,** 179–187.

Zou, L. W.–Chan, R. Y. K. 2019. Why and when do consumers perform green behaviors? An examination of regulatory focus and ethical ideology. *Journal of Business Research* 94(1)**,** 113–127.

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Forum on Economics and Business
22(139), 62–76.

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Simplification of sustainable development indicator systems through Principal Component Analysis

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The main aim of this paper is to reduce the indicators of the European Union's Sustainable Development Strategy and the United Nation's 2030 Agenda indicators through Principal Component Analysis, with minimal information loss. The European Union's Sustainable Development Indicator System (EU SDIs) was grouped around 130 indicators based on 10 topics. Over time, this indicator system has been reworked due to the overriding goals, objectives and the progress made. In 2015, in Paris, 193 UN member states signed the next global sustainability programme. The 2030 Agenda framework strategy uses indicators that are difficult to interpret because of their size and their progress. Within the strategy, 244 indicators have been created, covering the three aspects of sustainable development. The current study describes a method to reduce the sustainable development indicators that are part of the strategy. With this reduction, progress on sustainable development goals can be more easily understood at the European Union level. The principal component determines the properties, characteristics and indicators that have the greatest impact on sustainability. With this method, I can reduce the size of the database and, at the same time, drawing conclusions becomes easier and faster.

Keywords: sustainable development indicator system, EU Sustainable Development Strategy, UN 2030 Agenda, Principal Component Analysis.

JEL codes: O52, Q01, Q56.

Introduction

The Club of Rome made the first steps in the direction of sustainable development (Rosta 2008). Essentially, steps have been taken towards sustainable development since 1968. Many international conventions (Stockholm – 1972, WCED – 1987, Rio de Janeiro – 1992, Johannesburg – 2002) emerged, trying to find the answer to economic, social and environmental challenges (Láng 2001). The real breakthrough came from the Brundtland Commission, which developed the three pillars (economic, environmental, social) and the concept of sustainable development (WCED 1987).

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In Paris, 193 members of the United Nations (UN) gathered to discuss the new sustainability programme, resulting in *Transforming Our World: the 2030 Agenda for Sustainable Development*. This 2030 Agenda is valid for all the nations without exception. They formulated 17 goals (SDGs) on the basis of which the European Union developed its new sustainable development indicators (UN 2015).

My research is based on two sustainability strategies, on the European Union's *Sustainable Development Strategy* (referred to as EU SDS, COM 2001) and on the UN strategy entitled *Transforming Our World: the 2030 Agenda for Sustainable Development* (UN 2015), which provides its conceptual framework and indicator system. The period examined in the study is 2015, the year of EU SDS completion and adoption of the 2030 Agenda strategy, which is essentially the only year for comparison.

In terms of Principal Component Analysis, we speak of a statistical procedure that transforms a set of variables using a linear transformation. It ensures maximum information retention; consequently, the lowest amount of information is lost. Why is it essential to keep information at a high level? Because, in general, it is difficult to create a system for sustainable development and sustainability, even more complicated with so many indicators.

My goal was defined to provide a reduction with the help of Principal Component Analysis. The main objective of the study is to reduce the high number of indicators in order to make the goals of strategies and systems more transparent.

To demonstrate my goal, I will first introduce the two most important theoretical strategies that seek to address the issue and objectives of sustainable development worldwide. The results of the research will be presented below. The complexity of the two indicator systems comes to the fore when we want to analyse a particular region, a country in the European Union or simply the European Union itself. Fewer indicators make it easier to analyse and draw conclusions.

Conceptualisation and methodology

Sustainable Development Strategy of the European Union

In preparing the integration of sustainable development into different policies, social interest groups, previous treaties and the Cardiff Summit played a

decisive role (Lyytimäki et al. 2011). In 2001, the Council of the European Union approved the Sustainable Development Strategy at the Gothenburg Summit (EC 2001), which complements the Lisbon Treaty (EU 2007) with the environmental dimension (COM 2001). In Gothenburg, objectives were identified that needed to be integrated into economic, social and environmental policies to create the conditions for sustainable development in the European Union (Schmuck 2002). It is a long-term strategy, which is based on the three dimensions (economy, society, environment) of the Brundtland Commission. It coordinates the policies in order to meet present and future generations' needs as well as to offer them better living conditions and welfare.

The EU SDS set the following goals (EC 2001):

- Fight against climate change;
- Sustainable production, consumption and transport;
- Public health, global poverty;
- Preserving production resources;
- Addressing the issues of ageing population and social exclusion; poverty reduction, immigration management.

We may view the EU SDS goals as supplementing the Lisbon Treaty because they define threats which must be fought. The set of objectives was designed with catalyst and bridging roles in mind. The bridging role means that they need to develop a strategy which concentrates on the emerging threats: climate change, public health, poverty, the mix of high life expectancy with low birth rate, biological diversity under threat, traffic failure (COM 2001).

The EU SDS was modified in 2006 and suspended in 2015 after the release of the UN's 2030 Agenda (UN 2015). The modification meant that the renewed EU SDS set out an integrated and coherent strategy on how the EU could more effectively live up to its long-term commitment to the challenges of sustainable development (EC 2006). In the interpretation of Sabel and Zeitlin (2010), the renewed strategy distinguished between "general objectives" and more specific "operational objectives and targets". For example, the overarching goal of "Climate change and clean energy" was to limit climate change and its costs and negative impacts on society and the environment. In terms of duration, it was in force for 14 years.

Sustainable development indicators of the EU

The European Union's sustainable development indicator system (EU SDIs) is grouped around 130 indicators based on 10 topics. However, not all of the indicators can be measured (numerically five) (Kis-Orloczki 2013). The themes can also be grouped according to the Brundtland Commission's three-dimensional sustainability system.

The SDI system is also designed to show how the EU has made progress towards its goals which are described by the EU SDS, the Sustainable Development Strategy (Eurostat 2015). In fact, the strategy also has a controlling role in achieving the goals. In order to fully understand the path to sustainable development, it is advisable to look at all the indicators. Eurostat published biennial indicators of sustainable development which gave the Member States a summary of their own and other Member States' performance. The collection of indicators for this strategy ceased in 2016.

Transforming Our World: the 2030 Agenda for Sustainable Development

After completion of the United Nations' framework strategy on Millennium Development Goals (MDGs) (UN 2000), it was necessary to develop a new, long-term programme package that would continue and renew millennium development ambitions and goals.

The strategy entitled *Transforming Our World: the 2030 Agenda for Sustainable Development* was adopted in September 2015 by 193 UN member states (UN 2015). Compared to the MDGs, the similarity is that both strategies include goals, objectives and indicators and the SDGs were typically 'built' for purposes that could not be or could be only minimally achieved or that had been expanded during MDG implementation (Walsh et al. 2020). The 2030 Agenda includes appropriate ways to distribute aid to poor countries, the role developed countries have and how much responsibility they have to take in the period from 2015 to 2030 (Jancsovszka 2016; Bebbington–Unerman 2018).

The 2030 Agenda focuses on goals that seek to develop a more comprehensive approach to sustainable development. In terms of the number of goals, 12 were initially set, later supplemented by 7 other goals. The 2030 Agenda had set a total of 17 targets before the adoption of the framework that best reflected the aspiration for sustainable development (Griggs et al. 2014). The creators of the strategy complemented the 17 sustainable development goals (SDGs) with 169 objectives that are even more capable of expressing what they want to achieve

by 2030 (de Vries 2015). They demonstrate ambitious plans and levels of new universal programmes. They take the bold and transformative steps that make sustainability and the world flexible. The framework can also be described as the 5Ps (Planet, People, Peace, Prosperity, Partnership), as it focuses on these five areas (Chakrabarti et al. 2018).

In March 2016, the UN Statistical Commission adopted an indicator system that can best measure the sustainability goals formulated in the 2030 Agenda. Globally, 244 indicators have been developed, with 154 being currently relevant at the European Union level. These sustainability indicators are collected by Eurostat with the help of the Member States in order to monitor the progress of the countries and the European Union towards the various, specific objectives. The indicators can be further broken down, although not all indicators contain aggregated data, so there are 223 indicators in total after division at EU level. The breakdown of indicators means that, in some cases, such as the 'employment rate', an indicator can be broken down into the ratio of males to females and also include aggregated data (total). When aggregate data were available, I used it in the analysis. In other cases (e.g. energy dependence), I was able to distinguish two versions of the indicator, gaseous and solid fuels, so both were included in the database.

In order to achieve the best and most efficient implementation, the goals should not be reached individually but combined and they should be managed as far as possible. By implementing the framework, they are confident that the lives of the citizens will change significantly and the Earth will become a much more liveable place.

Research question

The main objective of the study is to reduce the high number of indicators in order to make the goals of strategies and systems more transparent.

My main research question is *whether PCA is a suitable method for reducing the number of EU SDS and 2030 Agenda indicators with minimal loss of information.*

Data and method

Data related to the indicators of the EU SDS and the 2030 Agenda are available for all 28 EU Member States in the Eurostat database. For the purpose of my study, I use data from 2015, which is the year of EU SDS completion and adoption of the 2030 Agenda strategy and therefore the only year when indicators from the two sets

are comparable. The two strategies contain a total of 10,836 data points for year 2015. In order to make the overview and interpretation easier, the enormous number of indicators need to be reduced, but without loosing relevant information.

The high number of indicators was reduced using Principal Component Analysis (PCA), a statistical method that, with linear transformation, converts a large variable set into a new, reduced set of uncorrelated variables (Székelyi–Barna 2002). The method is designed to minimise the loss of information (preserve most of the content) and thereby select those principal components whose information content (variance) is the highest. More simply put, those with the greatest weight are selected. We can draw almost the same conclusions from the principal components that have been created as from the original variables (Ketskeméty et al. 2011). In the original model, the statistical population characterised by the variable p is characterised by the variable $k << p$ from which the principal components are derived. The conclusions of our k-dimensional analysis for this p-dimensional population will also be correct (Ketskeméty 2012). The method can only be performed if the following steps are maintained:

- Involving variables into the model;
- Assessing data suitability on the basis of the KMO criterion;
- Suitability of variables – adequately characterise the principal component;
- Rotation of factors.

Without following these steps, the method cannot be performed. This statistical method uses the full variance and the resulting factors can include both the individual and error variance (Sajtos–Mitev 2007). The analysis was performed using the IBM SPSS software.

Results of the Principal Component Analysis

I have carried out PCA for each of the 10 EU SDS themes and the 17 SDGs. Indicators on the four levels (main, operative, explanatory, contextual) can break down into further sub-indicators. The EU SDS has a numerical index of 126, with a total of 200 sub-areas and with some of them also differentiated according to gender, thus the final number of indicators reaches 162. The SDGs have 223 associated indicators.

Due to space limitation in this article, I will present the detailed analysis only for one EU SDS theme and one SDG and I will give an overview of the results for all EU SDS and 2030 Agenda goals.

Results of the PCA for EU SDS Theme 2 – Sustainable consumption and production

Theme 2 of the EU SDS has 22 associated indicators. The first PCA step is to include in the analysis the variables (indicators) that are relevant to the given goal. There are a number of methods to assess the values of the KMO (Kaiser–Meyer–Olkin) criterion. The values are interpreted according to Molnár (2015). The KMO value is the average of the MSA (sample suitability measure) values. The KMO value applies to all variables, while the MSA is used only for some variables. We accept it if the value is above 0.5, but lower values cannot be accepted (Sajtos–Mitev 2007). A KMO ≥ 0.5 is weak, a KMO ≥ 0.6 is medium, a KMO ≥ 0.7 is appropriate, a KMO ≥ 0.8 is good and a KMO ≥ 0.9 is very good (Molnár 2015).

Table 1 shows the results of the KMO and Bartlett's test. The KMO value is 0.761, thus factor analysis can be performed.

Table 1. KMO and Bartlett's test result (theme 2)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.761
Bartlett's Test of Sphericity	Approx. Chi-Square	1197.642
	df	91
	Sig.	.000

Source: own research

In the next PCA step, the question arises as to whether the variables really characterise the properly formed principal component. The Total Variance Explained table shows the information content presented by the variables. The PCA makes sure that at least 50% of the information content is retained (cumulative column). If the value falls below the desired limit, it does not make sense of the principal components. It could happen that we may not be able to deduce the conclusions from the principal components that have been created as compared to the pre-transformation data set. In this case, the solution would be to create the next principal component. Table 2 shows the values of the information obtained.

Table 2 shows how much of total information is covered by the four principal components. In case of 13 principal components, it would reach 99.987% and with 14, 100%. The total explanatory force of the four principal components is nearly 86% and only 14% of all information is lost. Principal components are aligned according to the size of the variance. The first factor has the highest eigenvalue/explained variance (7.415/52.966), the second stands at 2.001/14.293 and so on.

Table 2. Information content of principal components belonging to theme 2

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	7.415	52.966	52.966	7.415	52.966	52.966	7.227
2	2.001	14.293	67.259	2.001	14.293	67.259	3.027
3	1.362	9.728	76.987	1.362	9.728	76.987	1.594
4	1.205	8.610	85.597	1.205	8.610	85.597	1.225
5	.770	5.499	91.096				
6	.463	3.307	94.403				
7	.335	2.396	96.798				
8	.212	1.518	98.316				
9	.132	.942	99.259				
10	.042	.297	99.556				
11	.034	.239	99.795				
12	.019	.137	99.933				
13	.008	.054	99.987				
14	.002	.013	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Source: own research

For a better understanding of principal components, the rotation of the factors must be performed. During the rotation, neither communality nor all the variations explained will change, only the eigenvalue/explained variance. I used the so-called non-orthogonal rotation method (the *Promax* method), which performs better when the primary purpose of the research is to interpret the factors and when a large database is available, like in the present case. Table 3 shows the rotated factor weight matrix for theme 2.

When we interpret the factors, it is advisable to examine the factor weights and their explanation more thoroughly. Based on Sajtos–Mitev (2007), the factor weight is the correlation between the variable and the factor, and its square gives the degree of variation explained by the factor in the variable. The greater the weight of the factor is, the more the factor will explain the variance of the variable. As a general rule, the factor weight must reach at least 0.3 in absolute value.

Table 3. Rotated factor weight matrix for theme 2

Indicators	Component			
	1	2	3	4
SDI_2_1_7_emiss_of_non_methane_volatile_org_compounds_tonnes	.960	.379	-.084	-.072
SDI_2_1_2_res_prod_and_dom_mat_consump_thousand_tonnes	.954	.195	-.066	-.007
SDI_2_1_8_emiss_of_ammonia_tonnes	.953	.383	-.108	-.128
SDI_2_2_1_final_energy_consumption_by_sector	.951	.483	-.247	-.078
SDI_2_1_3_municip_waste_by_waste_man_oper_waste_tret_thou_tonnes	.943	.484	-.257	-.103
SDI_2_2_suppl_trans_and_consump_of_electricity_TOE	.940	.502	-.285	-.096
SDI_2_1_6_emiss_of_nitrogen_oxides_tonnes	.830	-.058	.369	.213
SDI_2_1_5_emiss_of_sulphur_oxides_tonnes	.770	-.219	.419	.334
SDI_2_resource_productivity_PPS_per_kilogram	.380	.858	-.160	-.068
SDI_2_1_1_2_final_consump_exp_of_househ_by_consump_purpose	-.174	-.768	.245	-.320
SDI_2_3_1_ecolabel_licenses	-.561	-.596	-.278	-.396
SDI_2_1_1_1_number_of_persons_in_households	-.120	-.232	.833	.022
SDI_2_1_4_gen_of_hazard_waste_by_economic_activity_kg_per_capita	-.139	-.417	-.424	.220
SDI_2_2_2_motorisation_rate	-.070	.142	-.121	.841

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.

Source: own research

The larger the sample (df) is, the smaller the factor weight matrix is. The item number for theme 2 is 91, so the factor weight must be at least 0.580. Indicators with this value or higher belong to principal components.

For the EU SDS theme *Sustainable consumption and production*, we can conclude that, in addition to complying with Principal Component Analysis rules, 13 indicators (variables) were left out of the four principal components of the original 22 variables, thus the number of indicators was reduced by 41%. Indicator 2.1.4 – generation of hazardous waste by economic activity – was left out. The other indicators were dropped during the examination of communalities. This means that resource productivity (Euro/kg); generation of waste excluding major mineral wastes; resource productivity and DMC; municipal waste by waste management operations; area under agri-environmental commitment; area under organic farming and livestock density index were left out. The first principal component contains resource use in the EU, waste generation and energy consumption, household

electricity. The second principal component includes indicators that imply the main indicator (resource productivity) of the theme and one contextual indicator, expenditure of households on final consumption. Both indicators are significantly related to Gross Domestic Product (GDP) because this variable is the basis for their calculation. The third and fourth principal components include just one variable each (the number of persons living in a household and the motorisation rate).

Results of the PCA for SDG 8 – Decent work and economic growth

SDG 8 – *Decent work and economic growth* – consists of nine indicators. Two of them (resource productivity and domestic material consumption) can be split into two sub-indicators, bringing a total of 10 variables to the analysis. The KMO and Bartlett's test is 0.748, which can be classified as adequate-good (Table 4).

Table 4. Proportion of variance for SDG 8 (KMO and Bartlett's test)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.748
Bartlett's Test of Sphericity	Approx. Chi-Square	212.520
	df	21
	Sig.	.000

Source: own research

The characteristics of variables and indicators are in the forefront of analysing each goal. Table 5 shows how much of the information they can keep in the process.

Table 5. Information content of the goal related to the economic dimension

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	3.262	46.604	46.604	3.262	46.604	46.604	3.234
2	1.578	22.550	69.154	1.578	22.550	69.154	1.622
3	1.004	14.346	83.500	1.004	14.346	83.500	1.060
4	.463	6.617	90.117				
5	.435	6.219	96.336				
6	.152	2.168	98.504				
7	.105	1.496	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, the sums of squared loadings cannot be added to obtain a total variance.

Source: own research

Three principal components have been created, retaining 83.5% of all information, so only 16.5% is lost. The first factor has the highest eigenvalue/ explained variance (3.262/46.604), the second reaches 1.578/22.550 and the third, 1.004/14.346.

Table 6. Rotated factor weight matrix for SDG 8

Indicators	Component		
	1	2	3
sdg_08_30_employment_rate_20_to_64_years_total	.932	-.141	.142
sdg_08_40_long_term_unemployment_rate_total	-.926	-.085	-.141
sdg_08_20_young_peop_neither_in_empl_nor_in_educ_and_traning	-.913	.301	.016
sdg_08_11_investment_share_of_GDP_by_institut_sectors	.604	.551	.198
sdg_08_60_people_killed_in_accidents_at_work	-.047	.853	-.150
sdg_08_10_real_GDP_per_capita	.535	-.683	-.132
sdg_12_21_resource_product_and_domestic_material_consump_1000_t	.140	-.090	.970

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.

Source: own research

For better interpretability, I used the *Promax* rotation method for SDG 8 as well (Table 6). The item number of SDG 8 is 21, therefore only the indicators with a factor weight of at least 0.89 in absolute value are considered to be relevant. The first principal component includes three indicators related to employment (employment rate, long-term unemployment rate and young people neither in employment nor in education and training). The third principal component is related to a single indicator (resource productivity and domestic material consumption). Thus, using the PCA method, I grouped the indicators related to SDG 8 around three principal components and I reduced their number from ten to four.

Overview of the PCA for all EU SDS themes and 2030 Agenda goals

The method described in the sections above was run for all EU SDS themes and 2030 Agenda goals and, as it can be seen from Tables 7 and 8, all of them met the criteria for Principal Component Analysis (KMO > 0.5).

In terms of their information content, these themes and goals are excellent at preserving the properties of the original database, namely their value is well above 50%. The number of principal components ranges from 2 to 4. In each case, the PCA method reduces the number of indicators. Thus, the answer to the main research question – *Is PCA a suitable way to reduce the number of EU relevant indicators related to the EU SDS and the 2030 Agenda with minimal information loss?* – is affirmative.

Table 7. Reducing EU SDS indicators

Themes	Value of KMO	Information content	Principal components	Initial/final number of indicators
Socio-economic development	0.710	71.648%	3	23/14
Sustainable consumption and production	0.761	85.597%	4	22/13
Social inclusion	0.694	80.833%	4	30/14
Demographic change	0.655	81.564%	3	11/3
Public health	0.717	81.376%	4	19/13
Climate change	0.744	76.292%	2	15/4
Sustainable transport	0.722	84.517%	4	15/10
Natural resources	0.508	66.855%	3	9/1
Global partnership	0.711	72.176%	4	12/10
Good governance	0.534	61.050%	2	6/0
			Total	162/82

Source: own research

Table 8. PCA results for the 17 Sustainable Development Goals

	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7	Goal 8	Goal 9
KMO	0.702	0.614	0.722	0.688	0.655	0.542	0.553	0.748	0.587
Information content (%)	76.978	76.413	77.052	87.178	72.515	68.898	73.128	83.500	74.972
Number of principal components	3	3	3	3	4	3	3	3	3
Initial/final number of indicators	13/9	12/6	21/6	9/6	16/11	12/2	15/6	10/4	7/2
	Goal 10	**Goal 11**	**Goal 12**	**Goal 13**	**Goal 14**	**Goal 15**	**Goal 16**	**Goal 17**	
KMO	0.743	0.700	0.638	0.635	0.542	0.608	0.743	0.756	
Information content (%)	82.631	76.043	88.533	81.192	74.937	73.843	87.059	85.211	
Number of principal components	2	4	4	4	2	3	3	2	
Initial/final number of indicators	15/9	19/8	14/9	13/8	6/3	12/3	20/9	11/5	
	Total			223 initial indicators/106 final indicators					

Source: own research

Tables 7 and 8 provide evidence that the Principal Component Analysis is an appropriate method to decrease the high number of indicators related to the EU SDS and to the SDGs. With the help of PCA, I managed to reduce the 162 indicators of the European Union's Sustainable Development Strategy to 82 and the 223 indicators of the 2030 Agenda framework to 106 variables. In terms of their information content, both the 10 themes and the 17 goals meet the 50% information retention criterion, thus, the initial set of data is appropriately characterised. As a result of the reduction, the interpretation of sustainable development indicators has become simpler and more transparent, and sustainable development goals can be characterised more easily. My initial assumption was therefore proved to be correct. Overall, for the EU SDS, the number of indicators could be reduced by 49%, while, for the 2030 Agenda, by approximately 53%. By carrying out the PCA, the ten themes and the 17 sustainable development goals can be characterised more easily. The indicators that are most prominent and important within the objectives have come to the fore as best describing the goals. In this case, it is not necessary to examine as many indicators in order to draw conclusions.

Conclusion

Indicator systems monitoring sustainable development are extremely diverse and the themes and goals are quantified by almost 385 indicators, which – due to quantification – implies complexity when we want to examine a particular region or a country or even the indicator system. In order to address this and to make indicator systems more transparent, I wanted to use PCA.

In this study, I examined whether Principal Component Analysis could reduce the EU SDS and the 2030 Agenda indicator sets. Using this method, it turned out that the EU SDS indicators could be reduced by 49%, while the 2030 Agenda's 223 indicators for sustainable development could be reduced by 53% if only indicators with the greatest explanatory power were included into principal components. Thus, sustainable development themes, goals and objectives can be characterised by far fewer indicators and subsequent research will become easier because it is no longer necessary to pay attention to inappropriate indicators, those that do not properly characterise the given topic or objective. The principal components identified by the PCA method determine the properties and characteristics of indicators that have the greatest impact on the goals and objectives of sustainability and thus become more measurable in the analysis. In

the case of other EU SDS and 2030 Agenda analyses, we do not have to deal with the dropped indicators.

References

Bebbington, J.–Unerman, J. 2018. Achieving the United Nations Sustainable Development Goals. *Accounting, Auditing & Accountability Journal* 31(1), 2–24.

Chakrabarti, K.–Dahiya, B.–Gual, C.–Jorgensen, T.–Obguigwe, A.–Okitasari, M–Queralt, A–W. Richardson, C.–Sáenz, O.–Takemoto, K.–Tandon, R. 2018. *Approaches to SDG 17 Partnership for Sustainable Development Goals (SDGs).* Barcelona: Métode.

COM 2001. *A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development. COM/2001/0264.* Brussels: Commission of the European Communities.

de Vries, M. 2015. *The Role of National Sustainable Development Councils in Europe in Implementing the UN's Sustainable Development Goals.* Berlin-London: EEAC.

EC 2001. *Presidency Conclusions – Göteborg.* http://www.consilium.europa.eu/en/european-council/conclusions/pdf-1993-2003/g%C3%96teborg-european-council--presidency-conclusions-15-16-june-2001/, downloaded: 07.06.2017.

EC 2006. *Renewed EU Sustainable Development Strategy.* https://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2010917%202006%20INIT, downloaded: 07.06.2017.

EU 2007. *Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community (2007/C 306/01).* http://publications.europa.eu/resource/cellar/688a7a98-3110-4ffe-a6b3-8972d8445325.0007.01/DOC_19, downloaded: 08.10.2018.

Eurostat 2015. *Sustainable development in the European Union. 2015 monitoring report of the EU Sustainable Development Strategy.* Luxembourg: Publications Office of the European Union.

Griggs, D.–Stafford Smith, M.–Rockström, J.–Öhman, M. C.–Gaffney, O.–Glaser, G.–Kanie, N.–Noble, J.–Steffen, W.–Shyamsundar, P. 2014. An integrated framework for sustainable development goals. *Ecology and Society* 19(4), 1–24.

Jancsovszka, P. 2016. Fenntartható Fejlődési Célok (Sustainable Development Goals). *Tájökológiai Lapok* 14(2), 171–181.

Ketskeméty, L.–Izsó, L.–Könyves Tóth, E. 2011. *Bevezetés az IBM SPSS Statistics programrendszerbe. Módszertani útmutató és feladatgyűjtemény statisztikai elemzésekhez.* Budapest: Artéria Stúdió Kft.

Ketskeméty, L. 2012. *Faktor- és főkomponens analízis.* http://www.szit.bme.hu/~kela/microsoft%20powerpoint%20-%20faktor-%20és%20főkomponensanal%C3%ADzis.pdf, downloaded: 02.04.2018.

Kis-Orloczki, M. 2013. Analysis of the Eurostat SDI set. In: Ferencz, Á. (ed.) *Gazdálkodás és Menedzsment Tudományos Konferencia: Környezettudatos gazdálkodás és menedzsment.* Kecskemét: Kecskeméti Főiskola, Kertészeti Főiskolai Kar, 697–701.

Láng, I. 2001. Stockholm-Rio-Johannesburg. Lesz-e új a nap alatt a környezetvédelemben? *Magyar Tudomány* 46(12), 1415–1422.

Lyytimäki, J.–Rinne, J.–Kautto, P. 2011. *Using indicators to assess sustainable development in the European Union, Finland, Malta and Slovakia.* Helsinki: Finnish Environment Institute, Environmental Policy Centre.

Molnár, T. 2015. *Empirikus területi kutatások.* Budapest: Akadémiai Kiadó.

Rosta, I. 2008. A tudomány történetéből – világproblémák, globalizáció. A Római Klub három jubileuma 2008-ban. *Magyar Tudomány* 169(12), 1516–1522.

Sabel, C. F. –Zeitlin, J. 2010. *Experimentalist Governance in the European Union. Towards a New Architecture.* New York: Oxford University Press.

Sajtos, L.–Mitev, A. 2007. *SPSS Kutatási és adatelemzési kézikönyv*. Budapest: Alinea Kiadó.

Schmuck, E. 2002. *Társadalmi vélemény és részvétel az EU-stratégia tervezési folyamatában.* Budapest: Fenntartható Fejlődés Bizottsága.

Székelyi, M.–Barna, I. 2002. *Túlélőkészlet az SPSS-hez. Többváltozós elemzési technikákról társadalomkutatók számára.* Budapest: Typotex Kiadó.

UN 2000. *Resolution adapted by the General Assembly. United Nations Millennium Declaration.* https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_55_2.pdf, downloaded: 07.06.2017.

UN 2015. *Transforming Our World: The 2030 Agenda for Sustainable Development* http://cifal-flanders.org/wp-content/uploads/2016/03/UN-resolution-on-the-2030-Agenda-public-version-2016.pdf, downloaded: 30.03.2017.

Walsh, P. P.–Murphy, E.–Horan, D. 2020. The role of science, technology and innovation in the UN 2030 Agenda. *Technological Forecasting & Social Change* 154, 1–7.

WCED 1987. *Our Common Future*. London: Oxford University Press.

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