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Towards a more responsible sustainable innovation assessment and management culture in Europe

Rafael Popper, Monika Popper, Guillermo Velasco

ABSTRACT
This article presents new concepts and practical approaches resulting from the piloting of CASI-F – a common framework for the assessment and management of sustainable innovation (SI). Based on lessons learned from action research carried out in the context of the EU funded CASI project, the article focuses on the meta-analysis of 46 action roadmaps produced with 43 innovators supporting the practical application of CASI-F. The applied methodology helped to demonstrate that a multi-level and multi-actor advice approach promotes a shift towards improved understanding of innovations-related critical issues (barriers, drivers, opportunities and threats) and stakeholders' relations, as well as their management, thus promoting the sustainable resilience and transformation of socio-technical systems. This paper first reflects on how we arrived to managerial lessons from the actions roadmaps and how could these lessons be used to assess the current state of affairs and potential way forward for European initiatives and instruments promoting sustainable innovation.

KEY WORDS
sustainable innovation, management, resilience, action roadmaps

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Introduction

There is general difficulty in defining the concepts of sustainability and sustainable innovation (SI). Just as in Dr. Seuss's (Theodore Geisel) poem "Too many Daves" where Mrs. McCave had 23 sons and called each of them Dave, sustainable innovation as a term has multiple meanings and serves multiple purposes (including greenwashing), thus leading to misperceptions that, in turn, hamper the ability to effectively manage SI. To add even more complexity, this already fuzzy term is also used interchangeably with other, similar concepts, such as "eco-innovation", "environmental innovation", etc., even though these concepts do not entail the social aspect of sustainability (Charter & Clark, 2007). Improved conceptual understanding of SI, especially in relation to complex

societal challenges, to which sustainability efforts aspire to attend, shall be inclusive and dynamic so as to embrace the transformational nature of global changes. For this reason, the CASI project set out on an ambitious journey that allowed getting past a few misconceptions about SI.

During forty months of the CASI project, based on an ongoing study of SI including systematic mapping of SI initiatives, pilot studies with innovators, desk research and other mobilisation and mutual learning initiatives (followed by a multi-actor, multi-level and multi-perspective analysis), a sequence of CASI working definitions of SI has been conceived, which, integrated into the final definition (presented in the findings section) offer a holistic interpretation and improved conceptual understanding of SI. In other words, the CASI definitions of SI incorporated the perspectives of sustainable innovators (46 pilot studies), EC environmental research programmes (FP5, FP6, FP7 and Horizon 2020), citizens (27 research priorities from citizen-expert-citizen process), Pan-European SI stakeholders (online survey consultation, stakeholders workshops, policy dialogues) and environmental scholars (Porter & van der Linde, 1995; Fussler & James, 1996; Kemp & Arundel, 1998; Rennings, 2000; Andersen, 2002; Geels, 2002, 2005; OECD, 2005, 2009; Charter & Clark, 2007; Kemp & Pearson, 2008; Oltra, 2009; Carrillo-Hermosilla et al., 2009, 2010). CASI definition of SI highlighted the need to consider a wider range of sustainable innovations (i.e. 7 types of SI), the multiple roles of SI stakeholders, as well as management levels and dimensions of SI. All these considerations can support the assessment and management of sustainable innovations and their systemic transformations. Management actions, therefore, ought to consider multiple aspects for an action to be effective. Ten management key aspects associated to four dimensions were identified through direct interaction with the innovators, which underpinned the development and piloting of a common framework for the assessment and management of sustainable innovation (CASI-F) and gave rise to 150 meta tasks for SI management. The latter represent a practical set of take away lessons from supporting managerial decisions through 460+ actions related to the identified aspects, which arose from the application of the CASI-F framework, and in particular, step five (described below). We have then explored the usefulness of these lessons in assessing the status quo of four European initiatives and instruments and reflected on the way forward.

The findings, presented in this paper, thus aim to support the creation of contexts capable of addressing the complexity of socio-economic transformations related to SI, explore management issues associated with the attitude and aptitude of involved people, and improve the process that would lead to sustainable impact of an SI.

By discussing the *status quo* and possible way forward, the paper suggests that monitoring and evaluating the way European initiatives and instruments (both national and cross-national) support specific SI management key aspects could foster a more responsible sustainable innovation (RSI) assessment and management culture in Europe.

1. Methodology

The common framework for the assessment and management of sustainable innovation (CASI-F) was designed and implemented around five steps (Fig. 1). The overall methodology followed an inductive, bottom up orientation to understanding the complexity and dynamics of SI, and the multiple factors that influence their development, resilience and sustainability.

Step One "Sustainability relevance and scanning" involved scanning and nominating 548 sustainability-driven innovations with a focus on the European Commission Horizon 2020 Framework Programme's Societal Challenge 5 (i.e. Climate Action, Environment, Raw Materials and Resource efficiency) related priorities.

The SI scanning or nomination phase was then followed by Step Two "Multi-criteria analysis and assessment" that comprised of an in-depth assessment and analysis of 202 sustainable innovations in terms of their practices, outcomes and players. This second step was conducted through desk research supported by the CASIPEDIA knowledge co-creation tool and some interviews of selected innovators.

Step Three of CASI-F focused on "Critical issue analysis and assessment" considering the barriers, drivers, opportunities and threats that could potentially influence the development and sustainability of a SI. Over 1700 critical issues were identified and prioritised in close collaboration with 43 innovators and the non-restricted ones are available in the CASI "Ideas Bank". 60 managerial lessons from multiple perspectives (i.e. technological, environ-

mental, economic, political, social, ethical and spatial) were drawn based on the analysis of data set collected.

Step Four "Multi-level advice management" used a multi-level actions approach and resulted in 700+ actions for the quadruple helix of SI stakeholders, at three levels of management (i.e. strategic, tactical, operational), to previously prioritised critical issues. The actions were prioritised by the innovators in terms of importance, feasibility and their potential impact on the environment, society and economy. Primary research, such as face to face or telephone interviews and focus groups, was used in the assessment and prioritisation of multi-level actions.

Step Five "Action roadmaps management" aimed to develop sub-actions that allow to more effectively implement and manage selected actions. According to feedback from SI innovators involved in the piloting of CASI-F, "the five steps, especially the Action Roadmap methodology, were found to be satisfactory or highly satisfactory by 80% of the respondents. 86% of the innovators suggested that developing an action roadmap can support them in managing their innovation and 77% would consider putting them into practice" (Anttila, 2016). The sub-actions or tasks of the CASI-F roadmaps were structured around four management dimensions (context, people, process and impact) and ten management key aspects (momentum, foresight, resources, mobilisation, aptitude, attitude, catalysts, fosterers, transformations and sustainability) that emerged from the analysis of SI initiatives mapped and studied in CASI. The systematic analysis of 550+ tasks and 350+ themes related to actions prioritised by innovators involved in the CASI Pilot, which helped to identify 15 meta-tasks for each of the ten SI management key aspects framing the action roadmaps co-created with the innovators.

43 innovators from 12 EU countries were involved in the CASI-F Pilot and created 46 action roadmaps with the support of CASI partners. By analysing these action roadmaps 150 meta-tasks were identified (Appendix). Although the selected action roadmaps covered all four types of SI actors (i.e. government, business, civil society and research and education), the emphasis that the CASI Pilot put on technological and social innovations is clearly reflected in the more prominent number of roadmaps addressing actions of relevance to business and civil society actors and resulted in the following distribution of roadmaps:

- 48% for business actors,
- 28% for civil society actors,
- 20% for research and education actors,
- 4% for government actors.

The low number of action roadmaps addressing the government is due to the fact that the selected innovators found unlikely that they could make an impact on governmental actions.

Fig. 1, also known as the CASI-F journey, represents the mobilisation and mutual learning (MML) process and related interconnections of steps that led to the development of 46 action roadmaps and 150 meta-tasks, which were used in this study.

Overall, steps 1-3 focused on SI assessment led to the identification of 60 managerial lesson, as well as

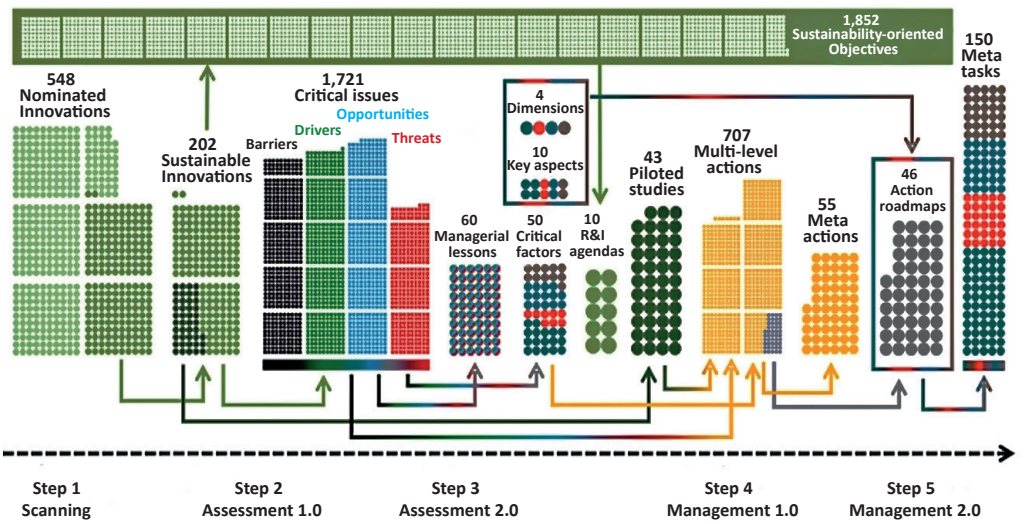

Fig. 1. The CASI-F Journey: Evolution of the common framework for the assessment to management of SI

Tab. 1. Multi-level and multi-actor aspects of SI management

Multi-Level & Multi-Actor approach	Government	Business	Civil society	Research and education
Top-level management: Strategic actions	Strategic actions involve the definition of high-level aims, challenges, goals, objectives and priorities that require strategic attention or orientation from top-level decision-makers in government, business, civil society, research and education organisations			
Mid-level management: Tactical actions	Tactical actions require mid-level decision-makers to translate strategic level objectives and priorities into tactical interventions, such as investment, research or knowledge transfer programmes and calls, funding schemes or instruments as well as development and implementation mechanisms			
Front-line management: Operational actions	Operational actions require the intervention of front-line decision-makers - policy makers, civil servants, entrepreneurs, citizens, researchers and workforce - who are directly responsible for the operationalisation of day-to-day activities linked to tactical and strategic actions			

Source: (Popper et al., 2017).

50 critical factors that informed the ten key aspects and four dimensions of SI. These were used in step 4 and 5 of CASI-F that focused on SI management through the development of over 700 multi-level and multi-actor actions linked to selected critical issues and 46 action roadmaps associated to prioritized actions.

The multi-level and multi-actor advice approach to SI management (Tab. 1) promotes the interaction, interconnectedness and interdependencies of SI actors, thus shifting from the individualist focus to exploring the connections and relationships of stakeholders.

Such approach involved the organisation of 43 pilot studies, whereby innovators co-created 700+ actions to be implemented by multiple actors with different managerial roles and responsibilities.

This article puts emphasis on the final step of CASI-F. A "reality check" from this analysis is then applied to two EU institutional initiatives, namely "EURADA" and the "EBN Innovation Network", as well as two European instruments, "Knowledge Transfer Partnerships" (UK) and the "Entrepreneurship 2020 Action Plan" (Tab. 3). Initiatives' websites and institutional reports were reviewed in order to gain overall understanding of their activities and scope.

The managerial lessons that emerged from the implementation of the CASI-F framework, and, in particular, step five, have been applied as a tool for the assessment of status quo of the initiatives as well as for providing reflections and recommendations on the way forward.

2. The CASI-F approach

The CASI-F journey and its results supported the development of SI related concepts, which can improve the overall understanding, assessment and consequently the management of SI. Regarding the typology of sustainable innovations, and given the growing complexity of societal challenges, it was agreed amongst research organisations involved in the study that a more holistic approach to the assessment of sustainable innovations should take into account a wider range of innovations, which in the context of CASI included product, service, social, organisational, governance, system and marketing innovations. While product, service and social innovations were recognised as most common and prominent amongst studied SI cases, the analysis of organisational, governance, system and marketing

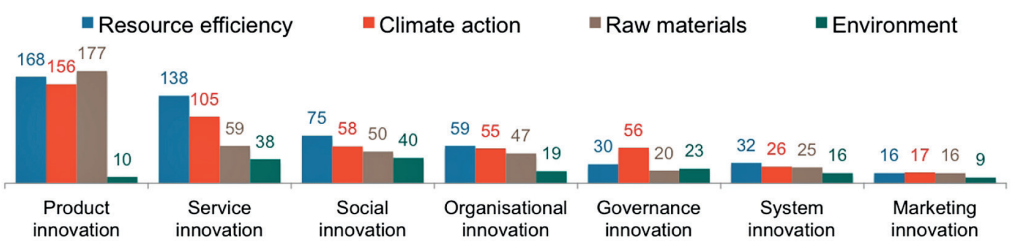

Fig. 2. Distribution of the 548 CASI cases by type of innovation

innovations showed a significant number of initiatives with equally and sometimes more important impacts in some sustainability areas or socio-economic sectors (Fig. 2 and Popper et al., 2017).

The analysis of positive multi-system transformations showed that all types of innovations are equally important for the achievement of desirable environmental, economic, societal, government and infrastructure system impacts, assimilating all seven types of innovations as an integral part of a wider socio-technical system. Finally, it was concluded that a more holistic approach to defining sustainable innovation (SI) should take into account the multiple roles of the quadruple helix of SI stakeholders – government, business, civil society and research and education – as innovators, supporters, sponsors and/or beneficiaries. With this in mind, a more holistic approach to responsible sustainable innovation (RSI) was defined as follows: **Responsible Sustainable Innovation** (RSI) is the result of a smart quadruple helix (S4H) oriented effort supporting the incremental or radical evolution of a socio-technical system based on positive multi-systemic transitions or transformations without compromising the needs, welfare and wellbeing of current and future generations. By multi-systemic transformations we mean environmental, economic, social, government and infrastructure systems while the S4H effort refers to a carefully planned and timely implemented mobilisation and mutual learning process engaging government, business, civil society and research and education stakeholders.

Apart from positive multi-systemic transformations, engaged SI actors believed that a systematic and forward-looking SI assessment should also consider the evaluation of critical issues (e.g. barriers, drivers, opportunities and threats) shaping and affecting the success of SI, in order to better inform managerial decision-making.

The management of SI and related critical issues should also take into account the strategic, tactical and operational nature of required actions. Furthermore, regardless of its type (i.e. process, service, social, organisational, governance, system or marketing), the management of SI should pay careful consideration to the context, people, process and impact dimensions. Finally, the results of the CASI study revealed that SI processes would also benefit from a holistic and sound portfolio of actions or tasks that take into account the ten key aspects of SI management associated to these dimensions, namely: momentum, foresight, resources, mobilisation, aptitude, attitude, catalysts, fosterers, transformations and sustainability (Tab. 2).

3. From roadmaps to meta tasks

Innovators of SI initiatives mapped in CASI were engaged in a mobilisation and roadmap co-creation process aimed to break the chosen action down into smaller tasks/sub-tasks.

Tab. 2. Key management dimensions and aspects

Context dimension	***Momentum*** refers to the force that gets a sustainable innovation moving forward	***Foresight*** refers to the future-oriented strategic drive of a sustainable innovation	***Resources*** refer to the means that can be drawn by a sustainable innovation to be designed, developed implemented and diffused	***Mobilisation*** refers to the capacity to reach and involve key stakeholders
People dimension	***Aptitude*** refers to the actual skill set or competences of people involved in the design, development, implementation and diffusion of a sustainable innovation		***Attitude*** refers to the type of behaviour of people responsible for the design, development, implementation and diffusion of a sustainable innovation	
Process dimension	***Catalysts*** refer to critical factors enabling the design and development phases of a sustainable innovation process		***Fosterers*** refer to critical factors supporting the implementation and diffusion phases of a sustainable innovation process	
Impact dimension	(Multi-agent) ***Transformation*** refers to positive changes in the quadruple helix of SI and knowledge production		(Systemic) ***Sustainability*** refers to changes in the socio-technical system in which the SI operates that lead to positive environmental, social, economic, government and infrastructure transformations	

Source: (Popper et al., 2017).

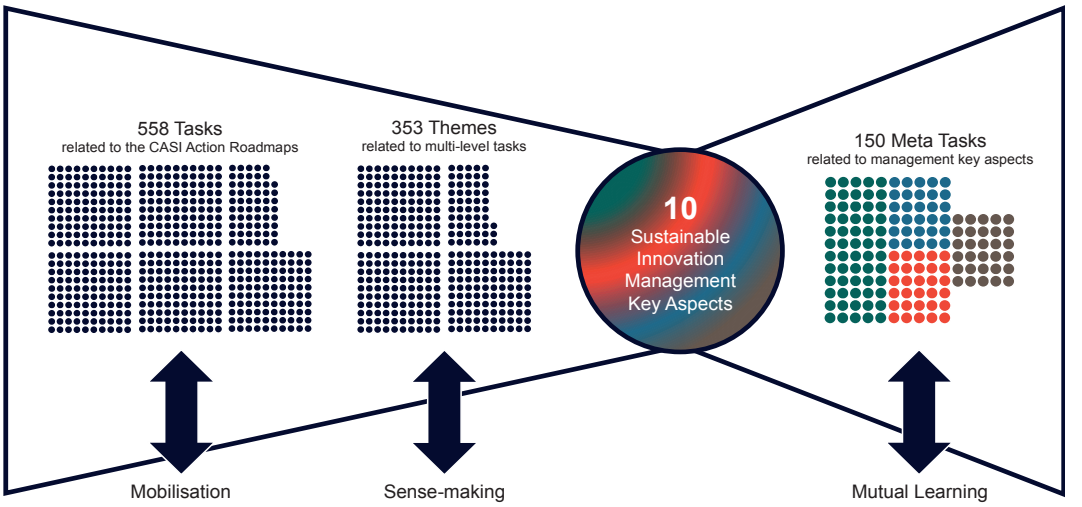

Fig. 3. From tasks to meta-tasks

These sub-tasks addressed ten SI management key aspects related to four SI management dimensions:

- context – momentum, foresight, resources, mobilisation,
- people – aptitude and attitude,
- process – catalysts and fosterers,
- impact – transformation and sustainability.

Mobilisation of innovators in developing action roadmaps resulted with a total of 558 co-created tasks. The collection of tasks was analysed by Inova+ (Anttila, 2016) who conducted a sense-making exercise and identified 353 themes clustered by type of actor (government, business, civil society and research/education) and management levels (strategic, tactical and operational).

To further promote mutual learning, a team from the University of Manchester re-clustered and further analysed the themes in order to arrive to a more manageable and maximum number of 15 meta-tasks per key aspect. As a result a total of 150 meta tasks or lessons from 46 the CASI roadmaps were identified. Fig. 3 illustrates the funnelling process.

The next section presents selected examples of how the afore-mentioned 10 key aspects (with meta-tasks listed in the Appendix of this article) can apply to two EU institutional initiatives, namely "EURADA" and the "EBN Innovation Network", as well as two European instruments, "Knowledge Transfer Partnerships" (UK) and the "Entrepreneurship 2020 Action Plan" (Tab. 3).

Strong commitment towards innovation, oriented towards regional development (especially in the case of EURADA), ability to foster actors' interaction, interest in facilitating knowledge transfer processes (Wynn & Jones, 2017), proved capacity to support entrepreneurs' innovation activities, e.g. the Entrepreneurship 2020 Action Plan (European Commission, 2012), and incubating innovation (EBN, 2017) are some reasons that justify the selection of these cases.

4. Towards a RSI culture in Europe

Although this section does not aim to discuss in detail the application of all meta-tasks to each management aspect, the most relevant ones for each case study are discussed through two specific questions:

- How are EU entities and European instruments actually performing in relation to the discussed SI management aspect?
- What tasks can innovation actors implement in relation to the discussed aspect?

4.1. Momentum

Status quo: To contribute to the momentum EURADA harmonizes the needs of regional agencies with the political context while supporting their interests before EC and other organizations. The EBN innovation network, in turn, assists these European organizations and other national and regional public authorities and agencies in reinforcing European

Tab. 3. Selected case studies

Case studies (EU initiatives) for the application of CASI Meta tasks	
EURADA	"EURADA, the European Association of Economic Development Agencies, was established in 1992. It is an inclusive, Europe-wide network of people working on economic development. It exists to serve the needs of its members: identifying and promoting best practice in economic development, representing members' interests with the European Commission and the key organisations within it or associated with it, helping its members to work more effectively by brokering partnerships and helping to foster cross-border business, and maintaining strong international links outside the European Union to bring global best practice to further enhance the capabilities of its members" (EURADA, 2017)
EBN Innovation Network	"EBN is a network of around 150 quality-certified EU|BICs (business and innovation centres) and 100 other organisations that support the development and growth of innovative entrepreneurs, start-ups and SMEs. EBN is also a community of professionals whose day-to-day work helps these businesses to grow in the most effective, efficient and sustainable way" (EBN, 2017)
Case studies (European instruments) for the application of CASI Meta tasks	
Knowledge Transfer Partnerships (UK)	"The Knowledge Transfer Partnership (KTP) scheme helps businesses to innovate and grow. It does this by linking them with a university and a graduate to work on a specific project. Each KTP is a three-way partnership between a business, an academic institution and a graduate. The academic institution employs the recently-qualified graduate who works at the company. The graduate, known as the "associate", brings new skills and knowledge to the business" (UK Government, 2017)
Entrepreneurship 2020 Action Plan	"The Entrepreneurship 2020 Action Plan is the Commission's answer to challenges brought by the gravest economic crisis in the last 50 years. It is a blueprint for action to unleash Europe's entrepreneurial potential, remove existing obstacles and revolutionize the culture of entrepreneurship in the EU. It aims to ease the creation of new businesses and to create a much more supportive environment for existing entrepreneurs to thrive and grow" (European Commission, 2017)

innovation systems. In the UK, firms utilize the "Knowledge Transfer Partnerships" instrument to foster their research and innovation processes. This tool facilitates and strengthens the cooperation between businesses and academic actors in a context that calls for the creation of start-ups to strengthen research and generate innovation. With respect to entrepreneurial aspects, the Entrepreneurship 2020 Action Plan represents other practical solutions of the European Commission to growth related challenges emerging from the economic crisis.

Way forward: Leveraging existing and favourable momentum and contextual conditions for innovation can enhance social growth and sustainability. This implies undertaking analysis of the innovative firms' competition dynamics, identifying best practices, studying the most efficient management structures, capturing potential investors and learning about potential partnerships and network conditions. Through this exhaustive exploration, firms should identify critical issues and challenges that could eventually justify the modification of initial objectives. In parallel, proactive initiatives in firms may be taken to identify relevant people in politics and envisage impactful and prospective new regulations. Business practices (standards, certificates, tools) should then be reformulated accordingly. Promotional and marketing efforts (which may boost the brand image) have to be complementarily aligned with these initiatives.

4.2. Foresight

Status quo: EURADA informs and updates regional agencies about latest policies and trends. Forward-looking initiatives include the discussion and reflection on upcoming management methods for regional development. The EBN innovation network also provides its members with a broad range of empirical data, practices, trends and management tools. KTP, in relation to long-term plan and future perspectives, encourages the development of joint research (firms and academic actors) the impact of which is to a large extent aligned with socio-technical trends. The Entrepreneurship 2020 Action Plan provides not only knowledge on market trends (Market Monitoring Mechanisms) but also possibilities for experiencing new business models.

Way forward: Future oriented government actions need to be based on an inventory of firms' strategic targets and projects and a scanning activity that helps to detect trends, practices, and opportunities of firms. This baseline information would give stronger sense to innovation policies that are really aligned with business strategies, including the defini-

tion of target groups, potential investors and potential alliances. The innovation policy formulation process should, in parallel, rely on dialogues with leading experts and engage the wider public in decision-making processes. In this respect, it is useful to utilise platforms and tools for communication and collaboration so that involved actors receive feedback on their own policy contribution.

4.3. Resources

Status quo: EURADA's actions for improving innovation are endorsed and supported by 69 regional agencies from 21 countries. The members are regional actors involved in economic development. The EBN innovation network has, among other resources, a platform with a portfolio of 35+ EU-funded projects. The institution has a wide expertise in entrepreneurship, regional development, incubation and innovation. While small to medium-sized firms contribute with a third of the firm-academic actors cooperation costs in the UK's KTP instrument, large firms contribute with half of the costs. The Entrepreneurship 2020 Action Plan shows valuable resources in the existing cooperation between clusters and business networks. This cooperation facilitates networking and exchange of best practices to improve SMEs efficiency.

Way forward: Resources for sustainable innovation need analysing with regards to the geographical coverage and prospective expansion plans, thus taking advantage of the possibility of implementing economics of scale. In addition, by gaining access to data on best European and global practices firms can also utilise information on relevant reference cases that help to map and manage resources and infrastructures. Availability of resources is basically related to the capacity of attracting business partners, investors and collaborators. This is sometimes influenced by the capacity of applying for local/national/EU funding with the right partners (e.g. engaging local citizens and local businesses as partners) and by an appropriate, ethical and fair use of champions and influential actors at the political level.

4.4. Mobilisation

Status quo: EURADA enlarges the capacity of international mobilisation of its members by promoting and brokering partnerships beyond the EC. The institution also fosters an intensive cooperation between its associates. The EBN innovation network, analogously, promotes international connections and assists in the definition of B2B partnerships. KTP induces actors' mobilisation in two directions; namely, it stimulates approaching initiatives of business actors towards the academic environment, and vice versa. To achieve it, the instrument invites firms to establish partnerships with academic institutions and their graduates. From other broader perspective, the European Commission, through the Entrepreneurship 2020 Action Plan contributes to the mobilization of the quadruple helix actors to be engaged in a network that assists the development of new business ideas, provides advice, and offers coaching on how to do business.

Way forward: Mobilisation improves the relationship of firms with policy-makers and investors. Therefore, it demands the identification of relevant actors' existing expansion strategies, the analysis of new stakeholders, the strengthening of existing networks, and the exploration of new training methods. All these requirements call for the development of reliable communication channels. Engaging a wider range of actors in innovation processes (e.g. organising workshops with regional/local stakeholders and citizens) increases the transparency of the decision-making process and raises awareness on sustainability. In addition, mobilisation facilitates knowledge-exchange and contributes to learning about failed practices and success stories.

4.5. Aptitude

Status quo: EURADA shares best practices in the area of local and regional economic development. This encourages members to improve their innovation-oriented initiatives. The institution also assists agencies and firms in the training of staff involved in regional development. The EBN innovation network provides training, peer-review, and professional services for incubators and accelerators. Including researchers in businesses environment through KTP facilitates knowledge transfers as the graduate provides new skills and knowledge to the firm. KTP mobilization lasts between 12 and 36 months. The Entrepreneurship 2020 Action Plan calls for the development of the Erasmus for Young Entrepreneurs programme to enhance competences and e-skills. The Plan organizes capacity building seminars, financed by ESF, that involve young entrepreneurs. Another objective of the Plan is to enhance cooperation within MS thus improving entrepreneurship education schemes in each country.

Way forward: Good practices on sustainable innovation require a varied set of competences. Some critical skills refer to the ability to understand and encourage more foresightful culture into organizations and institutions, develop effective leadership, and undertake different types of negotiation in various political contexts. It is also highly valuable to have a good understanding of the actual impact of the innovation. Creativity is an underlying feature that always exists behind processes, which objectives relate to innovation, regardless of the type of innovation such processes aim to address. These competences are usually the result of accumulating knowledge acquired from stakeholders and partners, hence the importance of identifying correct contact points for relevant innovation actors, facilitating internal knowledge sharing (e.g. away days), promote external knowledge exchange (e.g. study visits) thus encouraging mutual motivation among team members. Implementing systematic evaluation systems in the institution would make easier and more effective the matching of tasks with personal competences.

4.6. Attitude

Status quo: Encouraging and promoting knowledge circulation, for example, becomes a source of motivation and positive attitude for EURADA members. Sharing best practices actually stimulates agencies in their process of achieving more effective regional management and defining more precise and impactful development agendas. EBN, in addition, encourages co-working and participatory process within the innovation network. The KTP process enables researchers to provide new scientific leadership and research motivation to the firms where they are integrated. The Entrepreneurship 2020 Action Plan, in turn, activates best practices exchange and promotes the action of senior executive mentors. In particular, they consider as highly relevant the exchange of young entrepreneurs. Recently, the Plan has formulated initiatives to attract migrant entrepreneurs.

Way forward: Communicating and clarifying the vision of the organization to the staff is a first step to achieve people's commitment with the objectives and to promote cost-savings and quality-improvement spirit. In addition, it also contributes, together with the implementation of incentives for personal engagement, to creating an innovation culture grounded in social responsibility rationales, increase understanding of end-users and customer needs, and foster optimism, engagement and collaboration. Externally, it is notably important to engage high-profile people as ambassadors and mentors in disseminating facts on positive impacts of the innovation. Similarly, top managers can be involved in attitude-changing campaigns, and nurturing dialogue between employees and local community may have in key stakeholders' attitude. External recognition of this sort would also facilitate effective recruitment processes that guarantee the incorporation of people who are passionate about the cause.

4.7. Catalysts

Status quo: EURADA stimulates and accelerates innovation processes at regional level by enabling the cooperation of its members with the EC and other European institutions. EBN networking and assisting processes also contribute to the development of innovation processes through high-level events, conferences and workshops. A supporting element of KTP is the utilization of advisers that review the feasibility of projects and help firms to find academics or researchers that may be involved in the exchange programme. The Entrepreneurship 2020 Action Plan aims to consolidate partnerships within the Enterprise Europe Network thus becoming an effective instrument for spreading information on EU initiatives, finance, and innovation practices.

Way forward: Funding is a catalyst of innovation processes. In this respect, innovators may be tempted to apply for multiple sources of funding and organize crowd-funding campaigns. Funding sources are more effectively achievable when the process involves key business partners in research activities, includes new actors at different stages,defines educational material on the innovation's impacts, and conducts pilots/testing exercises with specific groups so as to reveal the actual impact of the innovation. The latter frequently implies the elaboration of ex ante evaluation of the innovation process. Launching an innovation process and getting an early and appropriate operational pace require the identification of scalability challenges (and reacting accordingly) and the introduction of learning-by-doing methods to deepen knowledge. Initiating cooperation and taking part of communication networks (e.g. through the involvement of local and national media) would also help innovators to reach larger audiences.

4.8. Fosterers

Status quo: EURADA analyses the know-how needs of the members so that knowledge exchange can be better promoted and the network efficiency reinforced. The EBN network, in turn, promotes benchmarking and continuous support of its members towards strategic aspects of innovation. Through the KTP, UK firms get academic support and expertise that eventually accelerate R&D. The process thus helps businesses to be more competitive and productive in terms of innovation. The Entrepreneurship 2020 Action Plan encourages the implementation of mechanisms that facilitate the creation of start-ups within universities and business creation in general. To foster innovation, the Plan also aims to reduce the administrative and regulatory burdens.

Way forward: Continuous dialogue and communication are essential to foster innovation. Some elements of this dialogue are the incorporation of experts in the innovation process (engaging them in relevant social research or political discussions), a continuous interaction with end-users, and the organization of networking activities. In these dialogues strategic actions would include the dissemination of best practices that highlight the environmental, social and economic impact, and the communication of re-investment plans that guarantee a continuous and sustainable innovation improvement. Other strategic aspects that foster sustainable innovation are based on the systematic identification and analysis of critical issues. This practice supports the generation of strategic, tactical and operational actions, the realisation of which may be eventually translated into mid- and long-term action roadmaps.

4.9. Transformation

Status quo: The EBN network helps innovative start-ups and entrepreneurs in reinforcing their innovation operations and eventually transforming regional and local economies. KTP strategies support job creation, which constitutes an important expression of socio-economic transformation. In fact, around 60% of researchers get a permanent job in the company where they collaborate. The Entrepreneurship 2020 Action Plan may be understood as a strategy to deploy Europe's innovation strength. Economic transformation is thus represented by the elimination of barriers to research and innovation and by the implementation of a culture of entrepreneurship.

Way forward: There are numerous parameters that can be utilised to measure and assess the impact of innovation. Some economic ones include job creation, promotion and setting up of spin offs, creation of knowledge-based products and services, emergence of new economic players, or promotion of entrepreneurship and innovations skills. Socially, we may recognise impacts of innovation processes in the raising of community spirit and young people's engagement or in the promotion of positive cultural and behavioural change. At environmental level, innovation may be useful to engage multiple actors in sustainability oriented visioning and to induce paradigm shifting on sustainability problems. A culture of innovation also supports success sustainability stories in targeted geographical areas.

4.10. Sustainability

Status quo: EURADA promotes the sustainability of their members' operations by seeking and proposing new modalities of funding. This strategy is essential to ensure the availability of innovation projects. The EBN innovation network also makes use of appropriate certifications that assure and maintain the quality standards of the member organizations. The potential for sustainability of KTP is given, for example, by the research outcomes. Along the exchange programme the academic partner produces on average more than three research projects and two papers. The Entrepreneurship 2020 Action Plan sets up measures for broadening markets for European enterprises, while mapping new opportunities for innovative firms.

Way forward: Guarantying the positive effects of innovation requires the broadening of firms' networks and a proactive collaboration with local stakeholders. Impact is also favoured by the identification of critical markets in need for further sustainable innovation, and by the detection of new ways to encourage cost savings. In this sense, a smart allocation of resources should also be a key part of cost oriented decisions and sustainability strategies. These strategies include self-sustainable sustainability campaigns and initiatives that encourage public engagement. From another perspective, we have to highlight the importance of implementing indicators and targets that help to focus on adequate environmental priorities and goals. The use of indicators, which is part of impact assessment activities, would be in addition more precise and efficient if actors are supported by proper sustainability management advice.

Conclusions

Mapping sustainable innovation initiatives and exploring their nature and characteristics can improve the understanding of concepts underpinning the assessment and management of SI. The systematic analysis of SI management actions prioritised by innovators involved in the CASI Pilot Study helped to identify 15 meta-tasks for each of the ten management key aspects framing the CASI-F roadmaps. The application of these meta-tasks to EU initiatives and European instruments of innovation proves to be a useful tool towards assessing the status quo of these initiatives and providing reflections on the way forward. Furthermore, it suggests that CASI-F can support a more responsible sustainable innovation (RSI) assessment and management culture in Europe and demonstrates the importance of following practices that inform responsible sustainable innovation policies. While this paper has helped to highlight that selected European cases are undertaking activities aligned with the ten management key aspects of SI, a more systematic study of national and cross-national initiatives, programmes and strategies would be needed in order to further position a responsible sustainable innovation (RSI) assessment and management culture in Europe.

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Appendix

Tab. 1. List of 150 sustainable innovation management metatasks

MOMENTUM		**RESOURCES**	
1.	Analyse competition	36.	Engage local citizens and local businesses as partners
2.	Analyse existing training programmes	37.	Evaluate and improve education material
3.	Analyse top-level and strategic management structures	38.	Expand geographical coverage with economics of scale
4.	Benchmark communication channels by target group	39.	Explore crowdfunding opportunities and innovation contests
5.	Create guidelines for industries	40.	Facilitate internal knowledge-exchange
6.	Gain senior management buy-in	41.	Gain access to data on best European and global practices
7.	Identify and study best practices and state of art of the field	42.	Generate information on relevant reference cases
8.	Identify critical issues and challenges	43.	Identify and monitor existing relevant databases
9.	Identify high objectives for project impact	44.	Include funding opportunities into concept development
10.	Identify new/relevant partnerships, networks, and investors	45.	Map and manage resources (e.g. limiting target groups)
11.	Identify relevant people and regulations in politics	**MOBILISATION**	
12.	Identify relevant structures and frameworks	46.	Conduct pilots encouraging sustainable values
13.	Improve business practices (standards, certificates, tools)	47.	Create multimedia content and social media campaigns
14.	Organise site visits	48.	Develop real-time communication channels
15.	Strengthen promotional/marketing channels (brand image)	49.	Engage in knowledge-exchange with similar projects
FORESIGHT		50.	Engage regional and local stakeholders
16.	Conduct inventory of strategic targets and projects	51.	Find advocates by launching competitions
17.	Create an internal and external communication strategy	52.	Gain internal support from management
18.	Differentiate “buzzes” from trends	53.	Identify existing expansion strategies
19.	Develop staff expertise and knowledge on future trends	54.	Identify new stakeholders and strengthen existing networks
20.	Engage into existing dialogue on topic with leading experts	55.	Identify training needs and develop new training methods
21.	Engage the public in decision-making processes	56.	Improve the relationship with policymakers and investors
22.	Explore platforms/tools for communication and collaboration	57.	Increase the transparency in the decision-making process
23.	Identify emerging business models, trends and innovations	58.	Organise workshops and roadshows to increase awareness
24.	Identify mutual objectives with other actors	59.	Promote public participation and citizen engagement
25.	Identify new target groups, potential investors and alliances	60.	Seek endorsements, references and success stories
26.	Monitor events, news, articles and conferences	**APTITUDE**	
27.	Organise brainstorm sessions to identify new ideas	61.	Accumulate knowledge with stakeholders and partners
28.	Scan the horizon for trends, practices and opportunities	62.	Adapt to different contexts, e.g. language, environment
29.	Set strategic objectives/activities	63.	Attract strategic partners and use public participation
30.	Set up umbrella organisations to deal with market changes	64.	Create exciting educational/training material (for trainers)
RESOURCES		65.	Develop critical skills (foresight, leadership, negotiation)
31.	Apply for local/national/EU funding with the right partners	66.	Educate public on the impact of the innovation
32.	Attract business partners, investors and collaborators	67.	Enable internal knowledge sharing (e.g. away days)
33.	Choose a spokesperson and lobby for resources	68.	Enable external knowledge exchange (e.g. study visits)
34.	Conduct an inventory of infrastructure needs	69.	Encourage mutual motivation among team members
35.	Develop infrastructures for monitoring and marketing	70.	Engage administrators/managers in critical issues mapping

APTITUDE		**FOSTERERS**	
71.	Engage stakeholders in innovation and idea generation	111.	Develop and upgrade innovation by engaging in research
72.	Foster creativity, research skills and networking	112.	Engage experts in creating the teaching materials
73.	Identify correct contact points for stakeholders	113.	Engage into relevant social research or political discussions
74.	Implement systematic evaluation system	114.	Ensure continuous dialogue with end-users
75.	Matching correct people with correct tasks	115.	Exploit the best existing bottom-up processes
ATTITUDE		116.	Highlight the environmental, social and economic impact
76.	Create an innovation culture with social responsibility	117.	Implement systematic management of critical issues
77.	Disseminate facts on positive impacts of the innovation	118.	Improve communication and dissemination plans
78.	Encourage enthusiasm and commitment to learn	119.	Promote ex post evaluation of impact and excellence
79.	Engage high-profile people as ambassadors and mentors	120.	Re-invest the savings gained for continuous improvement
80.	Foster interpersonal and communication skills	**TRANSFORMATION**	
81.	Foster optimism, engagement and collaboration	121.	Consolidate emerging players and promote spin-offs
82.	Increase understanding of customer needs and end-users	122.	Create knowledge-based products and services
83.	Involve staff in PR activities to clarify the company vision	123.	Create targeted campaigns on the impact
84.	Involve top managers in attitude-changing campaigns	124.	Engage multi-actors visioning and paradigm shifting
85.	Implement incentives for personnel engagement	125.	Foster sustainability in targeted geographical areas
86.	Nurture dialogue between employees and local community	126.	Foster transferability between different sectors
87.	Promote cost-savings and quality-improvement spirit	127.	Gather positive socio-economic and environmental stories
88.	Recruit people passionate about the cause	128.	Increase community sense and young people engagement
89.	Train ambassadors for the cause internally and externally	129.	Promote entrepreneurship and innovations skills
90.	Use several methods/tools to measure satisfaction	130.	Promote positive cultural and behavioural change
CATALYSTS		131.	Provide user-friendly information to stakeholders
91.	Apply for multiple sources of funding	132.	Refocus goals and priorities based on impact assessment
92.	Collaborate with local and national media	133.	Support the development of competences and skills
93.	Conduct ex ante evaluation of the innovation process	134.	Use innovative marketing to promote sustainable lifestyles
94.	Conduct pilots and testing with specific target groups	135.	Use job creation as measurement of impact
95.	Identify scalability challenges and react accordingly	**SUSTAINABILITY**	
96.	Initiate cooperation and networks to reach larger audience	136.	Allocate resources to support sustainable innovations
97.	Introduce learning-by-doing methods to deepen knowledge	137.	Create self-sustainable sustainability campaigns
98.	Involve employees and stakeholders in testing	138.	Develop green and social solutions in rural and urban areas
99.	Involve key business partners in research activities	139.	Develop transparent public engagement strategies
100.	Involve new actors at different stages of the process	140.	Emphasise the economic, social and environmental impacts
101.	Launch educational material on the innovation's impacts	141.	Expand the network and collaborate with local stakeholders
102.	Launch targeted PR and communication campaigns	142.	Identify critical markets in need for sustainable innovations
103.	Organise crowdfunding campaigns	143.	Identify new ways to encourage cost and energy savings
104.	Segment shareholders into groups	144.	Implement new regulations and incentives for sustainability
105.	Use bottom-up processes in the development phase	145.	Share knowledge on green firms, products and services
FOSTERERS		146.	Push for wider use of sustainability indicators and targets
106.	Apply for funding opportunities and programmes	147.	Refocus priorities and goals based on impact assessment
107.	Attend and organise networking activities	148.	Seek sustainability assessment and management advice
108.	Build collaboration practice with employees and partners	149.	Share sustainability best practices and infrastructures
109.	Create good practices, FAQ and guidelines for employees	150.	Support increasing deployment of sustainable services
110.	Create incentives for ambassadors and citizens		

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How do companies envisage the future? Functional foresight approaches

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ABSTRACT
The main aim of the paper is to present the synthesis of the results of methodological analysis conducted on examples of foresight projects executed in chosen companies representing four companies type: small and medium-sized enterprise (SME), non-profit-organization, international corporations and consulting companies as well as to posit functional approach for the implementation of foresight research within organizations. The empirical part of the study is based on the qualitative approach. A multiple case study methodology is employed. The research objects are sixteen companies experienced in foresight research. The first part of the paper gives an overview of definitions of corporate foresight and the analysis of background that have influence on the conducting of foresight in large multinational companies on one side and SMEs on the other side. In the field of the theory of foresight research, the study demonstrates that there are different motivations for foresight introduction as well as different organizational structure of teams conducting the activities and the approaches that they use. In the practical perspective, the study and a detailed functional foresight approach proposed by authors could be valuable for SMEs who consider implementing foresight research into their strategic planning processes.

KEY WORDS
corporate foresight, strategic foresight, foresight in/for business, small and medium-sized enterprises (SMEs), functional approach

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Introduction

By and large, strategic foresight seems to be an umbrella term for all the organizational activities embracing environmental scanning, the final choice of strategic options and integrating capabilities enabling the firm to detect discontinuous change early enough to interpret the consequences for the company and formulate responses, while at the same time maintaining a high-quality, coherent and functional forward view (Rohrbeck, 2010; Slaughter, 1995; Peter & Jarrat, 2015). Terms like "(industrial) futures research", "business futures", "strategic foresight", "strategic business intelligence", "strategic marketing intelligence" are also used to describe this field of practice (Ruff, 2015). As noted by Iden et al. (2017), "the field looks immature,

dominated by explorative research using case studies to construct arbitrary categories in order to organize and summarize empirical observations". Nevertheless, on the basis of the critical analysis of the existing published works carried out by the authors of the article, one may identify emerging research streams. Recently foresight is perceived more and more as a managerial competence in the constructing of the future of the organization, and not just a compile of methodologies through which organization may gain a broader vision of the future (Saprong et al., 2013; Rorbeck & Gemunden, 2011; Rohrbeck, 2010). According to the authors of the article, the openess to foresight managerial competence is indispensable for foresight capacity building within organization. As noted by Fidler (2011, pp. 540-541), from managerial perception, foresight could be classified as "search behavior" encompassing such activities as information gathering and the due-diligence processes undertaken in anticipation of a major move. Therefore, the reframing of an organization's essential understanding of a situation seems to be an explicit mandate for managers.

In order to support companies in the process of building and consistent reconfiguration of their strategic resources (especially in the face of continuous changes), which determine the competitive advantage, a methodological analysis has been conducted of examples of foresight projects executed in chosen companies. The authors of the article have posed the research problem in the form of three research questions, namely:

- What is the motivation for foresight introduction in the companies?
- What is the manner of organizing foresight research in the companies?
- What approach of foresight research is taken in the investigated companies?

Such organization of research allowed for identification of different motivations for foresight research characterization of specific models and concepts of foresight at the level of institutions; it also confirmed the presence of a need to propose a functional corporate foresight approach that should be able to provide outcomes that fit the needs of innovatively oriented SMEs. The selection of the companies for the case studies as well as the scope of the research was limited by the data accessibility.

1. Literature review

Foresight executed by enterprises varies in name as much as it does in motives, organisation and approach. Ruff (2004) breaks corporate foresight into: long term technology foresight, technology assessment, product impact assessment, innovation and technology analysis, technology monitoring, strategic technology monitoring, strategic competition analysis, prospective economic analysis, strategic market research, advanced marketing and trend research, future oriented organisational research and global developments and trend monitoring. In the recently published works on foresight in the enterprises, there function notions such as corporate foresight (Rohrbeck, 2010), strategic foresight (Saprong et al., 2013; Alsan, 2008) and business foresight (Jarvis, 2012). While these many different names for foresight no doubt indicate slight differences in approach, organisation and methodology, the varying terms are not used with enough consistency to discern any pattern. Therefore, the authors of the paper will use the notions of corporate and business foresight interchangeably.

Corporate foresight relates to projects run by individual companies, groups of companies, industry-wide associations, etc. within the private sector (JRC-IPTS, 2008). Daheim and Uerz (2006, p. 12) claim that the key to foresight is making sense of often contradictory information, drawing conclusions on their impact, dealing with diverging opinions, subjectivity and uncertainty, depicting future options, and, most importantly: deciding on actions to take. Will (2006, p. 4) claims that corporate foresight is a process of communication to build a mid-term to long-term vision of future markets, customer needs and societal challenges supporting the potential, competitiveness and innovation capability of a company. Palmer and Kaplan (2007, pp. 13-15) specify corporate foresight as a thorough understanding of the emerging trends, drivers, inhibitors, potential dislocations, and emerging opportunities within a market, industry or set of converging markets and industries. They add that organizations that possess foresight are better positioned to establish a strategy that leverages future trends – and even helps define them – to create a leadership position in the marketplace. They claim that gaining and applying foresight is a continuous activity that requires an organization to engage in processes that define an explicit linkage between the evolving external

environment, potential growth opportunities, and business strategies/tactics as well as create an ongoing capability for tracking and quickly responding to positive or potentially detrimental changes in the competitive business environment. According to Rohrbeck (2010, p. 11) organizational foresight is an ability that includes any structural or cultural element that enables the company to detect continuous change early, interpret the consequences for the company and formulate effective responses to ensure the long term survival and success of the company. Whereas Vecchiato, Roveda (2010) use strategic foresight deliberately to emphasize the tight relationship between foresight and strategy formulation. This interrelation had already been underlined by Slaughter (1995). The general definition that he provided was, in his own terms, an analogical one: "Foresight is a human attribute that allows us to weigh up pros and cons, to evaluate different courses of action and to invest possible futures on every level with enough reality and meaning to use them as decision making aids. The simplest possible definition of foresight is: opening to the future with every means at our disposal, developing views of future options, and then choosing between them".

The existing published works on foresight research in companies provide insight into the corporate foresight of large corporations and SMEs which both have common features and many dissimilarities (Major & Cordey-Hayes, 2000; Bidaurratzaga & Dell, 2012; Jun et al., 2013). As noted by Vishnevskiy et al. (2015), the similarities and differences are motivated by variations between the forms of ownership, the scope of activities, and the disposable resources of large companies and SMEs. According to the authors of the article, the important role may play also the openness of the organisational culture as well as the foresight awareness of the managerial staff. The main rationales of foresight research in companies have been studied (Daheim & Uerz, 2008; Gracht et al., 2010; Phillips, 2013; Battistella, 2014; Fikirkoca & Saritas, 2012; Vishnevskiy & Egorova, 2015). According to the authors of those articles they seem to be quite similar: SMEs and large companies try to anticipate volatility in the environment, prepare new strategies and identify business field to enter.

The manner of organising foresight research in the companies has been touched upon mainly by Cuhls and Johnston (2006), Becker (2003) and Daheim and Uerz (2006). Cuhls and Johnston (2006) categorize foresight projects along a continuum of two extremes, foresight for the purposes of creating change within the organisation, often using a broad focus and using a variety of external sources for information, and foresight focused internally used mainly for information gathering. Cuhls and Johnston plot different approaches along a continuum between these two extremes, including the three main approaches identified by Becker the Collecting Post, the Observatory and the Think Tank. The Collecting Post is mainly concerned with providing background information for the decision-making processes of the company and it is present in companies with low levels of foresight activity The Observatory is an autonomous foresight unit with a fulltime staff and a budget of its own. Its particular trait is that is fulfils a highly specialised and rather singular purpose for the company. The Think Tank is a special forward-looking unit, performing elaborate and broad foresight work in a company. This type of organisation can also provide foresight services to external clients (Pirttimäki, 2006, p. 61). Becker defines the Collecting Post approach as foresight that is strongly imbedded in other R&D activities. The people responsible for foresight in this approach are often "part-time futurists" who perform foresight activities in addition to other tasks. This type of approach is common where there are temporary foresight teams for "one off" projects. The collecting post usually collects information from existing data sources, rather than conducting exercises to generate their own data. Cuhls and Johnston place it at the internal information gathering end of the spectrum. Becker's Observatory is a more autonomous unit, with its own budget and full time staff. The observatory often has a single purpose or focuses on a specific issue or industry. The Observatory is usually organised by professional futurists with some experience, but they will often reuse pre-existing data from external sources, as well as generating their own new future oriented knowledge. The Observatory sits roughly in the middle of Cuhls and Johnston's scale, performing both internally focused information gathering and change oriented activities that use external information sources. According to Becker, the Think Tank is the broadest and most elaborate foresight approach. Like the Observatory, the Think Tank is usually an autonomous unit with full time specialist staff and budget, however its focus is broader; its purpose is to connect expert knowledge from multiple areas into a bigger picture of the future. Generally, the Think Tank uses more sophisticated foresight tools and is more change oriented than the Observatory. Cuhls and Johnston place the Think

Tank at the end of their scale, having a broad focus on a range of external factors and information sources and with the goal of initiating change within the organisation.

Daheim and Uerz add a fourth approach to Becker's three approaches to foresight, the outsourcer. Outsourcers are often independent foresight units like the think tank, but they focus only on defining the scope and goals of the foresight study, leaving the foresight process itself and large parts of the research to be conducted by external consultancies or agencies (often following a think tank approach), before re-integrating the results back into strategic planning and other aspects of the organisation. This approach to foresight is often used by enterprises, who frequently outsource the foresight research and process to external consultants.

Fig. 1 shows how Daheim and Uerz plot their four foresight approaches along the axes of scope and level of connectedness of the foresight tasks and the size of the teams. This graph is a mirror image of the Cuhls and Johnston graph implying that as foresight teams are more change oriented, the scope of their tasks and their networking with other resources and teams becomes greater. It also indicates that information gathering teams are generally smaller than change-focused foresight teams.

The vast majority of the cases investigated in the existing published works, utilized a "top-down" approach to foresight. Munnecke and van der Lugt (2006) compare these top-down down strategies with a "bottom-up" approach that uses the insights of front line workers and consumer needs as the main drivers of the foresight process. Very few organisations appear to be using these strategies, instead preferring the strategic planning focus of the top-down approach. However, the bottom up approach may be very beneficial, particularly in foresight exercises that are focused on a particular industry or aim to promote innovation. A few studies appeared to recognize the importance of bottom-up strategies, such as van der Duin (2006) and Havas (2006). Despite this, bottom-up approaches appear to have not been employed, either for practical reasons or because decision makers did not feel that it was important to involve consumers or front line workers in a meaningful way.

Relating to problems of corporate foresight and factors regarded as critical for its success, the authors of the paper will propose four functional corporate foresight approaches and will detail the one that should be able to support SMEs' decision making processes and reinforce their innovation orientation.

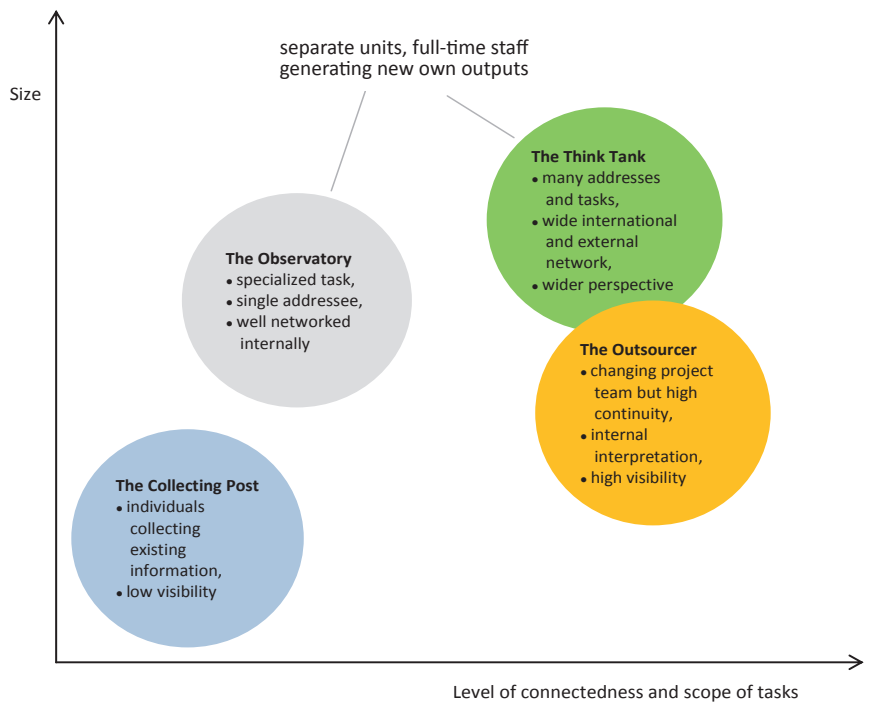

Fig. 1. The manner of organising foresight research

Source: (Daheim & Uerz, 2006).

2. Research methods

Taking into account the general objective of the study, the authors of the research base their work on the qualitative approach. In the first phase of the research, the authors of the article carried out a literature review on foresight in enterprises on the basis of EBSCO, Elsevier, Science Direct, Springer and Emerald databases. In the second phase, they employed the multiple case study methodology promoted by Denzin and Lincoln (2009) as as an appropriate approach in management sciences when the researcher seeks to provide in-depth understanding of the cases or a juxtaposition of a several cases. The information about investigated cases was retrieved on the basis of secondary sources such as the articles in the existing published works, company's reports as well as documented interviews with the presidents of the companies. The scope of the research was limited by the data availability.

Foreign foresight projects have been analyzed which were conducted by companies themselves (foresight in business) as well as projects run by external institutions for companies (foresight for business). In the "foresight in business" category the analysis covered companies representing the SME sector, a national non-profit organization and international corporations. As for the " foresight for business" category, the analysis dealt with projects run by a consulting company.

General characteristics of the companies are presented in Tab. 1.

The analyzed companies were diverse in terms of their size, geographic coverage (local, regional, national and international) and business activity (e.g. manufacturing, education). In the process of company selection (despite data availability), diversity of foresight project methodologies among the companies was a deciding factor.

The case studies have been analyzed with the consideration of the following aspects: motives, organization and approach to the conducted foresight projects. The results of case studies analyses of the chosen companies suggest the occurrence of certain trends in all of three aspects being a subject of analysis.

Tab. 1. General characteristics of the companies

Company type	Company name	Sector	Country headquarters
Foresight in business			
SME	Lunar Design	industrial product design	USA
	Białostocka Fabryka Okien	doors and windows industry	Poland
	BEWA	FMCG (beverages)	Poland
	Asterix (invented name)	children-book publishing	Hungary
	Institut Straumann AG	dental implants, instruments, prosthetics, and tissue regeneration products	Switzerland
Non-profit organization	Technology Promotion Association (Thailand-Japan)	technology transfer, education and training	Thailand
International corporations	Deutsche Telecom	telecommunications industry	Germany
	Shell	energy industry	Great Britain, the Netherlands
	Philips	diversified technology company (healthcare, consumer lifestyle and lighting)	The Netherlands
	Rovio Entertainment	entertainment media company	Finland
	Daimler Chrysler	automotive industry	Germany
	Finnair	transport	Finland
	Siemens	conglomerate company	Germany
	Volvo	automotive industry	Sweden
Foresight for business			
Consulting company	KPN Research	telecommunications industry	the Netherlands
	4CF	all	Poland

3. Research results

The growth of interest in foresight methodology application in companies is caused by the influence of external and internal factors. The most frequently indicated motives for foresight application in the group of the analyzed companies were the external factors, especially: growing competition (KPN Research, Deutsche Telekom, Lunar Design, 4CF); technological development (Deutsche Telekom, Lunar Design); identification of the relevant future fields (Volvo, Asterix), increasing budget limitations; volatility of financial markets and political and social determinants (Shell, TPA) leading to increase in risk and uncertainty of running a business; and also aspects of protection of the environment and environmental friendliness (Shell, Finnair).

The most significant internal factor was a planned company re-organization and thus a necessity to redefine the company mission and corporate strategy with the use of, among other, foresight methods (Shell, TPA, Białostocka Fabryka Okien, BEWA, Rovio Entertainment, Asterix). The most important goals of undertaking foresight initiatives in the analyzed companies were: striving towards raising the innovation level and strengthening the position on the market, determining technological development directions, and identifying potential market opportunities and threats.

A major motive (for firms like Siemens, Philips, operating in fast-changing sectors such as consumer goods and ICT) was to "never be surprised by future developments in the business environment", but to be aware of and possibly influence them. Thus, these companies use foresight as part of an early warning system in order to identify future trends and opportunities for their businesses (Becker, 2002). Additionally, Siemens and Philips, (representing technology-intensive sectors) use foresight more broadly in order to better understand the social/cultural context of the use of technology, firms and build up knowledge both about emerging technologies and their future users (Becker, 2002).

The size of the company was the factor which determined the differences in companies' motivation. In the case of the companies representing the SME sector (Lunar Design, Białostocka Fabryka Okien, Asterix), the most significant motives were the internal ones, especially striving towards raising the innovation level in the company. However, in the international corporations it was both external and internal factors which constituted the most significant impulses to undertake foresight initiatives. The most common external factor was growing competition, and the prevalent internal factor was striving towards strengthening the company's position on the market. The most common objectives of executing foresight projects are the following (Becker, 2002):

- priority setting – research and investment priorities identification and arrangement in terms of importance,
- direction setting – establishing company's general development directions,
- innovation catalyzing – innovation transfer stimulation and support,
- anticipatory intelligence – identification of market opportunities and threats,
- strategy formulation – formulating the corporate strategy.

Apart from the multitude of factors and objectives of undertaking and executing foresight projects in companies, another significant characteristic of this process is the manner of organizing research in companies. As a result of case studies analysis, four basic models were identified of corporate foresight implementation in companies: Collecting Post, Observatory, Think-tank, and Outsourcer. The Collecting Post model is implemented in small and medium-sized businesses (e.g. Lunar Design, KPN Research) in which analyses are conducted independently by employees in many departments with the use of relatively straightforward and inexpensive methods and tools. The Observatory model is applied in large national organizations (e.g. TPA) in which a temporary team appointed for the time of a particular foresight project conducts analyses of the company's micro-environment. In the case of international corporations which have in their structure research and analysis centers (e.g. Deutsche Telekom, Shell, Daimler Chrysler), research is conducted according to the Think-tank model in which a foresight specialized team does extensive research into micro- and macro-environment. Also, in chosen international corporations (e.g. Deutsche Telekom) and in large companies (e.g. TPA) the Outsourcer model is utilized. In this last case, due to limitations in human resources capacity and in financial outlays on corporate foresight, external consulting companies are employed (BEWA, BFO).

In the examined companies corporate foresight is an element of the strategic planning process and its results assist in making internal operational decisions.

When bottom-up approaches are used, it appears that this is mostly in SMEs. SMEs such as Lunar Design in the United States, the Swiss technology company Institute Straumann incorporate some limited foresight tools in their day to day activities (Andriopoulos & Gotsi, 2006), so does the Hungarian Asterix company in its everyday strategizing practice (Gáspár, 2015). Foresight in these SMEs is used primarily for innovation, with only a small emphasis on strategy, so the bottom-up approach is understandable and appropriate to their goals. In all four of these companies, foresight is closely integrated into the day to day R&D and operational activities and is conducted by employees who are not future specialists, and who perform foresight in addition to their existing tasks. This is very similar to Becker's Collecting Post organisational model, which is common in small businesses, due to the limited resources of most SMEs; few small companies can afford independent foresight teams or large scale foresight programs. However the use of bottom-up approaches by Collecting Post teams contradicts Becker's theory that such approaches are more likely to be used by Think Tanks that have greater autonomy in the organisation of foresight activities (Becker, 2003). Becker theorises that Collecting Posts tend to have their goals and methods dictated from above in a very top-down style, but this does not appear to be the case in these SMEs.

4. Disscussion of results

In the outcome of the conducted analysis, it has become apparent that foresight activities are conducted mostly in large companies (often multinational) rather than in SMEs. The reasons for that are the following:

- foresight activities are time-consuming, capital- and labour-intensive. Entrepreneurs of small and medium sized companies possess neither the time nor financial or human resources to allocate to extensive research in order to develop their long-term innovation strategies;
- foresight activities are conducted in order to analyse the macro environment of a company's business, which includes political, economic, environmental, social and technological factors, that imposes risks to which a multinational company is very often exposed. Whereas, small and medium enterprises operating mainly in the microenvironment, (which includes their customers, suppliers, competitors and stakeholders) have a limited need to capture long-term uncertainty, as their business activity does not involve a large amount of external risks. According to Hartman and Philippens (2004) SMEs feel external risks do not have much impact on their way of doing business. However, the consequences of change in the macroenvironment can influence the company more than changes in the microenvironment (e.g. the occurrence of wild card events);
- foresight activities are conducted in order to identify trends and drivers that might have considerable impact on a company's strategy in the long term. This aim is realised by large companies. SMEs do not plan many years forward, instead they focus on identifying short term trends, setting short term objectives and building short term plans. Entrepreneurs of small and medium companies prefer to work on concrete products, technologies and market needs regarding futures research as soft and changing rapidly.

Although foresight projects are less common in small and medium enterprises, there are some SMEs that do perform some foresight activities. However, due to the limited resources of SMEs, they do not perform the large scale foresight exercises common to bigger companies and government. Instead, foresight tools are closely integrated into the existing R&D and day to day operations of the company, as is the case in Lunar Design Incorporated, and Institute Straumann (Andriopoulos & Gotsi 2006; Savioz & Blum, 2002; Trumbach, Payne & Kongthon, 2006). According to Savioz and Blum (2002, p. 99), this strategy of imbedding foresight in the day to day activities of the company helps to create an "open minded company culture" that is favorable for foresight.

Being heavily embedded in other R&D projects and the day to day operations of the company, the foresight is usually conducted by employees in addition to their existing tasks. This puts the organizational model in Becker's Collecting Post (Becker, 2003). Foresight is conducted internally, with a focus on information gathering rather than on organisational changing, placing it at the information gathering end of Cuhls and Johnston's (2006) scale.

The motivation for foresight in SMEs is almost always innovation. Innovation is very important to SMEs. Trumbach, Payne and Kongthon (2006, p. 938)

assert that SMEs are often built around a single new technology or innovation. They also state that "research has found that small firms have a higher rate of innovations per employee, patents per employee, and output per dollar spent over large firms." They claim that this is because small firms are more flexible and are therefore better able to adapt to rapidly changing circumstances and emerging trends. All three of the SMEs studied used foresight primarily for innovation, only the larger mid-sized Institute Straumann listed corporate strategy as an additional motive (Savioz & Blum, 2002, p. 91). In the case of the Hungarian SME the on-going process of constructing and shaping the organisational future was not directly called as "foresight" but in the practice of the enterprise several elements could be found in similarly to other SMEs in the country. (Gáspár, 2015.) In Poland in 2009-2013 and in Hungary in 2012 an interactive foresight process for creating regional future concepts was developed, where personal meetings with SMEs and stakeholder groups was organized, and the networking created the interconnection between the stakeholders in the process of shaping regional future ideas (Kononiuk & Gudanowska, 2013; Hideg et al., 2014). This regional foresight activity also enriched the foresight tools used in the participating SMEs in Poland in 2009-2013.

5. Functional foresight approaches dedicated to enterprises

The results of the analysis of the described case studies were the basis for the elaboration of the functional approaches in case of implementation of foresight projects in enterprises. The key factor determining the choice of a particular procedure is the goal the company is aiming at when pursuing foresight initiatives. Due to the purpose of implementing the foresight process, the following approaches were proposed in the company:

- functional foresight approach for strategy building,
- functional foresight approach to stimulate and support innovation creation,
- functional foresight approach to navigate through opportunities and threats,
- functional foresight approach to set strategic directions and investment priorities.

Tab. 2 shows the main characteristics of the procedures, including the following: methods used (key method and supporting methods), industry sector (characterized by long or short product life cycles), time horizon (short, medium and long term), size of enterprise, model of foresight implementation in the company (Collecting Post, Observatory, Think Tank, Outsourcer).

The key factor determining the choice of a particular procedure is the goal the company is aiming at when pursuing foresight initiatives. Other factors include: the sector in which the company operates, the time horizon of the foresight exercise, the size of the company.

Assuming the sector and the time horizon of the exercise as a criterion of division of foresight approaches it should be noted that:

- for companies that operate in sectors with long product life-cycles (i.e. chemical, pharmaceutical, automotive, medical), where research activities are long-term oriented, the recommended approaches are: functional foresight approach for strategy building (based on the scenario building method) or the functional foresight approach to set strategic directions and investment priorities (based on key technologies method);
- for companies that operate in sectors with short product life-cycles and rapidly changing market conditions (i.e. electronics, telecommunications, IT), the short- to medium-term time horizon is required in foresight. The recommended procedures are: functional foresight approach to stimulate and support innovation creation (based on creative methods) or the functional foresight approach to navigate through opportunities and threats (based on technology monitoring methods).

Whereas, taking into account the size of the enterprise, the feasibility to implement the three of the four proposed procedures both in the smaller company (employing up to 50 employees) and in the larger company. It concerns namely: the functional foresight approach for strategy building; the functional foresight approach to navigate through opportunities and threats; or the functional foresight approach to set strategic directions and investment priorities. An exception is the functional approach used to stimulate and support the transfer of innovation, where, due to the high degree of interactivity of the foresight research conducted among all employees, it is recommended to implement it mainly in a smaller company.

Tab. 2. Functional foresight approaches dedicated to enterprises

	Functional foresight approach for strategy building	Functional foresight approach to stimulate and support innovation creation	Functional foresight approach to navigate through opportunities and threats	Functional foresight approach to set strategic directions and investment priorities
Key method(s)	scenario building	• blue-sky projects • brainstoming • modeling and simulation • trend analysis • environmental scanning • technology scanning • technology monitoring • technology scouting • weak signals	technology roadmapping/ technology scanning	key/critical technologies
Supporting methods	• SWOT • workshops • brainstorming • modeling and simulation • trend analysis • Deplhi • surveys • interviews • foresight literature review • cross-impact analysis • technology roadmapping		• technology scouting • SWOT • workshops • brainstorming • trend analysis • weak signals analysis • wild cards • environmental scanning • STEEPV	• foresight literature review (previous projects case studies) • workshops • brainstoming • brainwriting • STEEPV • SWOT • Delphi • surveys • interviews • patent analysis • bibliometrics • trend analysis • scenario building • technology roadmapping
Industry sector in terms of technology life-cycle	longer technology life-cycles (i.e. chemicals, materials)	short technology life-cycles (i.e. ICT, electronics)	short technology life-cycles (i.e. ICT, electronics), and/or longer technology life-cycles (i.e. chemicals, materials)	longer technology life-cycles (i.e. chemicals, materials)
Time horizon	long-term	short-term (within product life-cycle)	short to medium-term	long-term
Foresight model	• Collecting Post • Observatory • Think Tank (for a larger company) • Outsourcer	Collecting Post	• Collecting Post • Observatory • Outsourcer	• Collecting Post • Observatory • Think Tank (for a larger company) • Outsourcer
Implementation approach	top-down or bottom-up	bottom-up	top-down or bottom-up	top-down or bottom-up
Company size	10-50 or 50-250 employees	10-50 employees	10-50 employees	10-50 or 50-250 employees

Taking into account the high volatility of the external environment, the identified obstacles to implement foresight in smaller companies, and considering the need to build foresight capacities among SMEs the authors decided to focus on detailing the foresight approach that allows to navigate through opportunities and threats. The recommended approach is feasible to initiate and to implement in SMEs. It is also self-explanatory for company managers and it will help them understand how foresight could support their decision-making procedures and increase their innovation orientation in times of uncertainty.

The recommended approach is specifically suitable for enterprises operating in industries characterised by rather short technology life cycles in order to be able to keep up with new developments within and outside the company's main industry and act

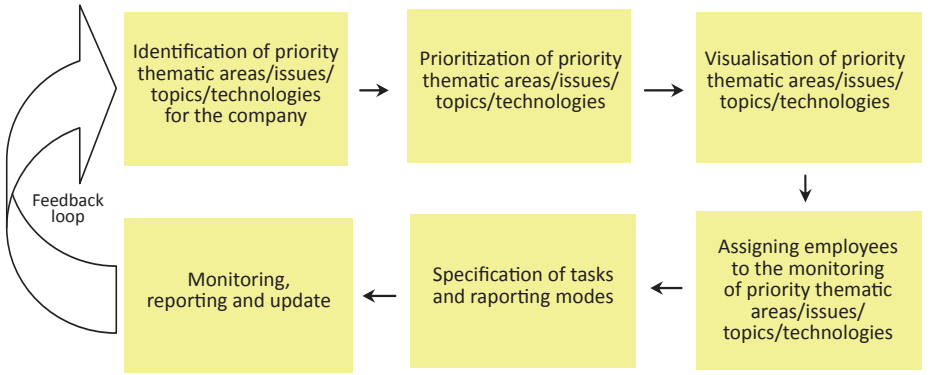

Fig. 2. The stages of functional foresight approach used to navigate through business opportunities and threats

Source: authors' elaboration based on (Savioz & Blum, 2002).

accordingly. That's why the suggested time horizon for foresight is that of strategic planning (5 years). Preferred modes of foresight activities include an independent department (Observatory); or temporary task forces (Collecting Post). In some cases (a highly innovative company, which provides high returns on investments) an Outsourcer model can be selected. Subsequent phases of the foresight approach are shown in Fig. 2.

The purpose of using the illustrated foresight approach is to identify and anticipate trends and achievements occurring in the company environment through their constant and systematic monitoring. The resulting knowledge is stored and used in the company's knowledge base. A key element here is to identify a link between the observed phenomena with the strategy of the company and vice versa.

The following stages of the procedure include:

- identification of priority thematic areas/issues/ topics/technologies for the company. For this purpose, two implementation approaches can be applied: top-down or bottom-up. In the top-down process, the starting point is the strategy and mission of the company, to which the management team of the company explores, analyses, assesses and assigns strategic, forward-looking areas of the company activities. In the bottom-up approach, these areas are defined by the employees of the top and middle level managers (medium-size enterprise) or by all employees (small company). They key methods involved are: workshops, brainwriting, brainstorming. Additional methods used at this stage include: SWOT analysis, interviews, literature review (foresight projects: national, regional, sectoral), trend analysis, internal Delphi;
- prioritization of priority thematic areas/issues/ topics/technologies. At this stage there is a division of all identified priorities into:
  - key areas, which are to be monitored constantly and in detail (information about them is needed at present as it supports ongoing decision making),
  - important areas, which are to be monitored periodically (information about them is needed within a medium time perspective),
  - additional areas (issues, which are monitored occasionally as the data regarding them is scarce and the directions of their prospect development are highly uncertain);
- visualisation of priority thematic areas, issues, topics, technologies. At this stage it is recommended to develop a strategic map of the areas presented in graphic form. This will help, among other things, to disseminate the examined key issues among employees and raise awareness (internally) towards the company's development priorities;
- assigning employees to the monitoring of priority thematic areas, issues, topics, technologies. The choice of such persons is made by the management of the company. They are usually the employees of the company, who are either most competent in the field or whose personal and professional skills allow them to easily explore the external territory and project the results on the company's strategy. The monitoring of a specific area of interest is usually an additional task of the employee. A company may also choose to involve external experts (technology scouts) in this activity;

- specification of tasks and raporting modes. Those responsible for monitoring individual issues use information derived from the analysis of the following sources: technology, market, competition to identify emerging changes and developments in these areas. The methods used at this stage include: literature review (professional press, popular press), social media monitoring, following online professional networks discussions, patent analysis, licensing; participation in conferences, seminars, interviews, online surveys. In order to make the activity sustainable, it is necessary to agree on the structure and frequency of reporting to the company management. It should be noted that an expert in charge of a subject collects and analyzes information systematically so that he constantly identifies potential opportunities and threats to the company and disseminate this information among key company employees;
- monitoring, reporting and updating a map of key areas/technologies for the future of the company.

The recommendations given by personnel who monitor the key areas, are used by the management of the company to decide whether to launch new projects or to cease financing of selected unpromising initiatives. Updating a map of areas and technologies that are crucial for the company's future by adding, deleting, or re-ranking existing priorities should be conducted once a year. In this way, the use of the procedure – alongside its main goal of the "identifying opportunities and market threats" – becomes a strategic planning tool, reflecting the company's strategy and its readiness for the future. Similarly, when the initial set of priority thematic areas, issues, topics or technologies is regularly updated, the approach enables to reinforce the company's innovation orientation.

The key message for company managers who could be potentially interested in applying the above described procedure is that it has been successfully verified in practice in BEWA company in 2015. The study aimed to develop a database supporting the identification and monitoring of upcoming opportunities and threats present in the FMCG sector. BEWA continues using the database and the method internally, while regularly consulting the outcomes and possible upgrades of the tool and the monitoring process with the strategic foresight consultancy (4CF), which designed and coordinated the company's internal foresight process. The detailed description of the process are given in Sacio-Szymańska et al. (2016, pp. 61-63), whereas its key outcomes and managerial implications are described in Sacio-Szymańska and Nosarzewski (forthcoming).

Conclusions

From the practical point of view – summarizing the answers to the research questions on the manner and approach of the activities – the carried out analysis demonstrates that foresight research may be useful for the company when it faces such external phenomena as growing competition in the sector, technological development, identification of the relevant future fields. The most significant internal factor for the foresight research in the investigated companies was a planned company re-organization and thus a necessity to redefine the company mission and corporate strategy. Other rationales of undertaking foresight initiatives in the analyzed companies were: striving towards raising the innovation level and strengthening the position on the market, determining technological development directions, and identifying potential market opportunities and threats.

The size of the company – coming back to the research question on the motivators of foresight introduction – was the reason which determined the differences in companies' motivation. In the case of the companies representing the SME sector, the most significant motives were the internal ones, especially striving towards raising the innovation level in the company. However, in the international corporations, there were both external and internal factors which constituted the most significant impulses to undertake foresight initiatives. The most common external factor was growing competition, and the prevalent internal factor was striving towards strengthening the company's position on the market. The authors of the article have also identified five major objectives of executing foresight projects, namely: priority setting, direction setting, innovation catalyzing, anticipatory intelligence and strategy formulation. Moreover, as a result of case studies analysis, four basic models were identified of corporate foresight implementation in companies: Collecting Post, Observatory, Think-tank, and Outsourcer.

The theoretical contribution of the paper to the fields of Management consists in the introducing a detailed functional foresight approach dedicated to SMEs in order to enhance their decision-making

processes and increase their innovation orientation. The posited by the authors approach takes into account foresight methods, features of a sector, in which a company operates, time horizon, foresight model, management style and a company size. In the focus of the paper there were the SMEs which highlighted the strategy of imbedding foresight in the day to day activities of the company, emphasizing the creation of an open minded, flexible company culture that is favorable to foresight.

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Pre-requisites of successful strategic electronic coordination: the moderation effect of the ownership mechanism of inter-organisational information systems

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ABSTRACT

In this paper, we attempt to explain how the ownership mechanism of an inter-organisational information system (IOS) may impact strategic information exchange (electronic coordination) induced by specific investments in the IOS. Recent research and practice show that heavy investments in IOSs demonstrate mixed results with respect to their impact on the electronic coordination. Consequently, the search of additional factors is needed to help and explain under what circumstances the IOS investments for strategic purposes become beneficial for the companies in a buyer-supplier dyad. Transaction cost economics (TCE) and the hostage model are used as a framework for the research. 198 observations of Norwegian companies in different branches of industry constitute the base of the empirical study. A buyer-supplier dyad is the unit of the analysis. A regression model of the relation between the IOS ownership mechanism and the strategic information sharing is used to test two hypotheses about the buyer-supplier collaboration via an IOS. The results demonstrate that the risk of unilateral specific investments in an IOS made by the buyer or the seller is attenuated by the ownership mechanism of the IOS. The willingness of a buyer to share their strategic information with the supplier via the IOS increases if the supplier invests in the IOS which is owned and controlled by the buyer. Conversely, the supplier becomes motivated to share certain sensitive strategic information with the buying company if the latter invests in the IOS which is owned and controlled by the supplier.

KEY WORDS

hostage model, inter-organisational information system (IOS), IOS ownership, specific IOS investment, strategic electronic coordination

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Introduction

Information sharing is one of the key constructs in Supply Chain Management (SCM). It is one of the most investigated direction in SCM research. Despite the large body of research in this area, there is a lack of ubiquitously accepted scientific frameworks considering the phenomena of information sharing in SCM (Kembro et al., 2014). The most commonly used theories in this field are Transaction Cost Economics (TCE), relational governance theories, contingency theory, resource dependency theory (RDT), and resource-based view (RBV). These theories aim to answer the following questions: "Why to share or not to share the information with others?", "What information should to be shared and with whom?", "How to share the information?", and "What are

the pre-requisites, barriers and drivers of the information sharing?"

This paper focuses on the pre-requisites to information sharing, namely, the exchange of the strategic information in buyer-supplier dyads via inter-organisational information systems (IOS). A literature review by Kembro et al. (2014) reveals the most important and studied pre-requisites of information sharing in supply chains. They are formal contracts which aim at preventing opportunism (Porterfield et al., 2010), norms of reciprocating benefits (Nyaga et al., 2010), the lack of competitive capabilities that promotes collaboration (Tan et al., 2010), and mutual dependence (Vijayasarathy, 2010). Examining each of the mentioned pre-requisites requires theoretical lens. Since it is a difficult task to use different theoretical frameworks in one model where information sharing is represented as a dependent variable, we choose TCE as the basis for this study. The influence of the basic TCE dimensions (such as asset specificity, environmental uncertainty, and frequency of exchange) on the information sharing is described in the literature rather well. Based on different levels of the mentioned constructs, companies choose proper governance forms which, in their turn, determine the scope and the intensity of information sharing in the supply chains. In this paper, we attempt to clarify the relation of the specific investment into an inter-organisational informational systems (IOS) and the exchange of the strategic information. To do this, we propose to include the IOS ownership mechanism in the analysis as a moderator in the relation "asset specificity – information sharing". There are two main reasons behind this proposition. First, norms and extra-contractual mechanisms are underestimated in TCE despite their impact on the way the relationships are governed in the supply chain (Kembro et al., 2014). Second, ownership mechanisms are closely related to incomplete contracts (Han et al., 2008). A firm who owns an asset can easily exclude the other firm from using it in case it is not specified in the contract (Hart & Moore, 1990). This argumentation leads to a proposition that the IOS ownership is an important dimension in finding the antecedents of information exchange in the supply chain and particularly in buyer-supplier dyads.

The investigated scope of information sharing via IOSs (which is represented as a dependent variable in the model) has been deliberately limited to the strategic type of information. We disregard the exchange of the operational information (such as information about payments, invoices, and inventory levels) because normally it requires neither heavy investments in IOSs nor sophisticated mechanisms for governance of the relations between the firms. Therefore, finding antecedents for strategic information exchange appears a much more difficult task than examining the operational one. Instead, we propose to examine the exchange of the operational information as a prerequisite to the strategic one.

To specify the knowledge under consideration in this respect, we define strategic information exchange as the coordination of production plans, sharing the data about the product and design modifications, as well as the development and the testing of new products. To show that the study deals with the information transferred via an IOS, we entitle the strategic information exchange "strategic electronic coordination". Information technology (IT) and IOS terms are used interchangeably in the context of our paper, although such an approach may not be suitable for different research directions. We use the term IT instead of IOS only when citing scientific literature where the term IT is used to describe the system that connects two or more companies in a supply chain.

198 buyer-supplier dyads have been investigated to test the proposition. Dyads represent Norwegian companies in various industries: manufacturing, retail, service, public procurement and others. Primary data is collected from the buyer's perspective.

The structure of the paper is as follows. The upcoming section briefly reviews the main theoretical frameworks, clarifies the problem area and formulates the hypotheses. The following two sections describe the research method and introduce a regression model of the IOS ownership's influence on the information sharing. Next, statistical results of the hypotheses testing are presented and described. In the last section, we discuss the results and the limitations of the research presented in this paper.

1. Theory and hypotheses

Strategic coordination problem has received considerable attention from various SCM researchers. The term "coordination" may have various meanings in the SCM literature. The examples are joint planning and product development, orientation on long-term cooperation, profit sharing, extensive information exchange, etc. (Larsen, 2000). Malone, Yates, and Benjamin (1987, p. 489) define coordina-

tion as "the information processing involved in tasks such as selecting suppliers, establishing contracts, scheduling activities, budgeting resources, and tracking financial flows". Since it is a difficult task for any researcher to grasp all the above-listed dimensions, we will concentrate on such aspects of strategic coordination as activity scheduling, i.e., production planning, product and design modifications, development and testing of new products. To facilitate coordination, companies in different industries often invest in a variety of IT tools (Sahaym et al., 2007). Examples of a successful IT implementations demonstrate a reduction in bureaucratic costs of coordination (Afuah, 2003), tighter links to customers, increased product variety (Johnston and Vitale, 1988). However, company efforts to improve the coordination by investing in IOSs do not always lead to a desirable outcome. Such factors as the expectation of an opportunistic behaviour, the power dependency structure, the type of the buyer and supplier market and others can either obstruct or significantly alter the expected results of strategic electronic coordination. That explains a considerable number of scientific frameworks provided in the literature trying to describe the reasons and the drivers of information exchange. For example, a literature review by Kembro et al. (2014) revealed 23 theories which can be used to explain information sharing in a supply chain. At the same time, this review identified that five out of 23 theories constitute 80% of all the suggested theoretical frameworks. These are TCE, relational governance theories (RGT), contingency theory, resource dependency theory, and the resource-based view (RBV). Among the reviewed articles, 66 out of the 82 papers use the dyadic relationships as a unit of analysis.

In the following subsection, we will present a TCE-based theoretical framework with the emphasis on hostage model as the one suitable for our research.

1.1. Transaction cost economics (TCE). Hostage model

The main stress of TCE is transaction governance (Williamson, 1985). Transaction costs can be minimised when appropriate forms of governance mechanisms are applied by contractual parties. In turn, the choice of the governance modes depends on the three basic TCE constructs. They are the frequency of exchange, the environmental uncertainty, and the asset specificity. TCE assumes that the actors may behave opportunistically. To reduce the risk of opportunism and safeguard the investments into specific assets, the companies can apply formal contracts (Williamson, 1985). Therefore, the formal contracts may be viewed in TCE as a pre-requisite for effective information sharing in the considered supply chains.

TCE may also be useful in understanding why information sharing is important, as well as in what cases it may be preferable not to share certain data. The main argument for information sharing is the reduction in the transaction costs and the uncertainty (Tan et al., 2010). On the contrary, partners may prefer to withhold sensitive information to diminish the threat of opportunism (Klein et al., 2007). In this case, the information is considered an asset that requires additional safeguarding mechanisms (Kembro et al., 2014). Therefore, it may lead to unwillingness to invest into highly specific IOSs (Tan et al., 2010; Klein et al., 2007).

At the same time, formal contracts cannot cope with all contingencies that may occur at the contractual stage. TCE underestimates the impact of extra-contractual tools that are also important in managing the supply chain relationships (Kembro et al., 2014). Therefore, the contracts leave room for including different ex-post tools that could serve as safeguards to specific investments (Ménard & Valceschini, 2005).

Asset ownership can be considered an important tool that serves as a safeguarding mechanism in addition to formal contracts. A firm owning a specific asset has the full control over the asset and can easily preclude a certain partner from using it (Han et al., 2008). The mentioned research underlines that the asset ownership mechanism provides the owner of the asset with a bargaining power. The authors suggest investigating the IOS ownership as a partial solution to coordination problem induced by specific investments.

To explain the mechanism of the influence that IOS ownership has on the coordination, Williamson's (1983) hostage model is used. The model is based on the idea that "the investments made by the suppliers are influenced by the incentives experienced by the buyers" (Williamson, 1983, p. 520). Williamson claims that the specific investments made by the suppliers on behalf of the buyer are at risk due to the fluctuations of the final demand which can negatively affect the buyer's commitments to buy the negotiated volumes of goods from the supplier. That may result in low levels of the supplier's investment into specific assets. To maintain specific investments at high levels, the supplier may want the buyer to post a "hostage"

that is lost if the contract is terminated ahead of time (Ahmadjian & Oxley, 2005). In turn, high levels of specific investments into the IOS made by the contractual parties are crucial for reaping full benefits from the IOS collaboration (Han et al., 2008). That makes the hostage model an appropriate scientific framework that could help to understand the drivers for the efficient strategic electronic collaboration.

There are several types of hostage models described in the literature: mutual hostages (Gemser & Wijnberg, 2001), partial equity stake hostage-based arrangements (Ahmadjian & Oxley, 2005), hostages in the form of reciprocal specific investments (Williamson 1983; Wathne & Heide, 2000). Hostage-based relationships are also described in the business-to-consumer environment (Dorsch et al., 2001).

In our study, investments in an IOS can be regarded as an example of a hostage model which is based on the reciprocity principle. Investments in the IOS made by the actors in the supply chain represent an example of the reciprocal investments. According to Williamson (1985, p. 532), this type of investments creates a "mutual reliance relation". In other words, these relations can be characterized by bilateral dependence which contributes to trustful relationships and reduces the incentives for the opportunistic behaviour.

A research paper by Heide and John (1990) highlights the idea that symmetric investments in specific investments made by the original equipment manufacturer (OEM) and the supplier create hostage relationships which act as a safeguard to the specific investments. The main drivers of the mentioned situation are high procedural and switching costs (Burnham, Frels & Mahajan, 2003). If mutual reliance relationship is prematurely terminated, the hostage company sacrifices their time and money spent on attuning/integrating its information system (IS) to the partner's IS. Also, in the case of investing in a highly customized IOS, the partners may face high switching cost due to the consecutive specific investment in personnel training programmes (human asset specificity). New personnel training programmes may be needed in the case of changing a business partner. High switching costs represent a strong bonding mechanism that forces companies to maintain relationships (Geiger et al., 2012; Blut et al., 2016).

With respect to our research goals, the question can be formulated as follows, "What conditions/factors may increase the robustness of hostage agreements based on reciprocal investments into an IOS and, therefore, increase the willingness to share the sensitive strategic information via the IOS?".

Investments in an IOS can be initiated by buyers or by suppliers. For instance, a buying company installs the software and hardware at its production site first and then it tries to establish electronic links with the supplier. In other words, the buyer who purchases and therefore owns the IOS makes the major share of the investment into the IOS for collaboration purposes and puts themselves at risk if the relationship with the supplier is prematurely terminated. In this situation, the supplier's contribution to IOS investments is limited basically to the investments in the IOS hardware and the following IOS integration procedures conducted both by the buyer and by the supplier. To simplify, when the buyer plays the major role in IOS investments and, thereby, owns and controls the IOS, the supplier's role in the IOS investment process becomes limited to adaptation/integration actions which costs less. Combining this example with the described hostage model and TCE, we can conclude that the buyer posts a hostage in the form of the owned IOS. The buyer may face high switching cost in case of a premature relationship termination. This type of hostage acts as a safeguarding mechanism for the supplier's specific IOS investments, and it relaxes the threat of the buyer's opportunism and, therefore, motivates the supplier to share the strategic information with the buyer. The other noticeable side of the IOS ownership mechanism is that it provides the full control over the IOS (control over databases, the possibility to exclude the supplier from IOS usage, etc.) and gives bargaining power to the IOS owner (Han et al., 2008). That relaxes a potential threat of the supplier's opportunism and, in turn, increases the buyer's willingness to exchange the strategic information with the supplier. We also assume that the same theoretical predictions are valid for the opposite situation when the supplier owns and controls the IOS, and the buyer adjusts its information system to the supplier's IS.

Hence, we offer the following hypotheses:

- **hypothesis 1**: when the buyer owns and controls the IOS, there is more positively shaped association between the supplier specific IOS investments and the strategic electronic coordination than under the conditions when the supplier owns and controls the IOS;
- **hypothesis 2**: when the supplier owns and controls the IOS, there is more positively shaped association between the buyer specific IOS investments and the strategic electronic coordi-

nation than under the conditions when the buyer owns and controls the IOS.

1.2. Other antecedents to strategic electronic coordination

To validate our regression model which may be referred to as "IT system ownership – strategic electronic coordination", we introduce four control variables to the model: the supplier's industry type (SUPIND), the length of IT cooperation (LNITCOOP), the product complexity (PRODCOMP), and the operational information exchange (OPER). The variable corresponding to the strategic electronic coordination is denoted COORD.

The product complexity was included in the model, as earlier research showed significant positive correlation between product complexity and vertical integration (Novak & Eppinger, 2001). Greater product complexity may increase coordination via an IOS although in cases when the product complexity is too high, personal meetings may be preferred to communication via the IOS (Hannås, 2007). We expect a positive association between PRODCOMP and COORD.

The length of IT cooperation with the supplier (LNITCOOP) was measured as the natural logarithm of the number of years the buyer and the supplier have been collaborating via an IOS (Heide & John, 1990). The duration of the prior relationship has a positive influence on the commitment (Deutsch, 1962) and encourages attachment (Levinthal & Fichman, 1988). Sometimes, the cooperation length may lead to defection patterns rather than the cooperation (Heide & Miner, 1992). In these cases, no effect of relationship duration on the cooperation should be expected. We expect a positive association between LNITCOOP and COORD.

The supplier industry type is included in the model to control for the possible differences between the IOS cooperation with the suppliers from the manufacturing sector and the suppliers from other industry types. The manufacturing industry is often used as a control variable in marketing research in the settings with specific investments (Stump 1995). We expect that the need for COORD is bigger for the dyads operating in the manufacturing sector due to the higher complexity of production process requiring more volumes of business information exchange compared to other industry branches. The variable is coded as a dummy variable: 1 – manufacturing industry, 0 – other industries (service, retail, public administration).

The operational information exchange (OPER) is defined in our study as the exchange of invoices, orders and the information about active replenishment of inventories conducted via an IOS. Premkumar (2000) and Saeed et al. (2005) identify the levels of the IOS development where the lowest level is considered the exchange of the simplest types of information like orders and payments. The authors claim that the IOS collaboration in the supply chains normally starts with the simplest operational level, and later, it may grow into a more sophisticated strategic form. We assume that operational exchange can be positively correlated with the electronic coordination because the efficient fulfilment of strategic actions (for example, collaboration over the development and testing of new products) requires operational information exchange on the purchase of materials and components for the tested new products. Also, we can expect a low level of system malfunctioning at the strategic level of the information exchange if the IOS have been previously tested and used for operational purposes.

2. Research method

A structural equation model (regression model) has been developed to test the hypotheses. For this model, the data has been collected with the help of the survey research. The e-mail based questionnaire with close-ended questions has been developed to collect empirical data, which was further processed for the model. The subsections below describe the process of data collection and present confirmatory factor analysis for the constructs used in the model "IT system ownership – strategic electronic coordination".

2.1. Data collection

A buyer-supplier dyad is used in this paper as a unit of analysis. We assume that IOSs have been used as the primary means of information exchange in the dyads. The information for this research is adopted from Norwegian companies of various industry types. 20 firms were used for pilot testing of the questionnaire to check the item reliability and to avoid potential misunderstandings in the questions (Hunt, Sparkman & Wilcox, 1982). The pilot ques-

tionnaire was revised upon obtaining feedback from respondents.

The Norwegian Association of Purchasing and Logistics (NIMA) took the responsibility to send the questionnaire to its members by e-mail. The size of the sample was 1365 companies. Data collection process has been conducted in two rounds with a time gap of two weeks. 198 answers were received for the hypotheses testing. The T-test had been conducted to measure the non-response bias between the two rounds of data collection (Armstrong & Overton, 1977). The test results have not revealed a significant difference between the two groups with respect to the annual sales volume, the number of employees, and the purchasing volume (Hannås, 2007).

The key informant approach was used to obtain reliable knowledge about the studied problem. This approach is widely used to investigate business-to-business relationships (Heide & John, 1992; Bensaou & Anderson, 1999; Buvik & John, 2000). With respect to our research objectives, we interviewed specialists who possessed specific knowledge in upstream supply chain operations (Hannås, 2007).

2.2. Measures for the regression model "IT system ownership – strategic electronic coordination"

To obtain the measures for model variables, we conducted the confirmatory factor analysis (CFA) in AMOS graphics extension to SPSS 22 software.

2.3. Confirmatory factor analysis for the construct electronic coordination

To grasp the potential scope of information exchange between companies via an IOS and pick items for the electronic coordination construct, we analysed literature on coordination and IOSs (Buvik & John, 2000; Joshi & Stump, 1999; Zaheer & Venkatraman, 1995; Subramani, 2004).

The dependent variable COORD and the independent variable OPER were obtained from the electronic coordination construct. The three-factor solution is offered for the electronic collaboration construct. The results of the CFA for the construct electronic coordination are listed below:
chi-square = 52.424; degrees of freedom = 24; probability level = 0.001; CMIN/DF = 2.184; CFI = 0.953; NFI = 0.920; TLI = 0.912; RMSEA = 0.078.
Strategic electronic coordination (COORD: 3 items, Cronbach's α = 0.842):

- (Q11_4) coordination of production plans (0.73),
- (Q11_5) product and design modifications (0.87),
- (Q11_6) development and testing of new products (0.83).

Operational electronic exchange (OPER: 3 items, Cronbach's α = 0.619):

- (Q11_2) ordering process (0.58),
- (Q11_3) invoicing and payments (0.65),
- (Q11_9) active replenishment of our inventories (0.57).

Documentation exchange (3 items):

- (Q11_8) tender processing (0.71),
- (Q11_10) document exchange (0.75),
- (Q11_11) product specifications (0.76).

Items Q11_8, Q11_10, Q11_11, which constitute the variable of documentation exchange, were not incorporated in our model.

2.4. Independent variables of the regression model "IT system ownership – strategic electronic coordination"

The supplier IT specific investments (SITINV) describe the investments in the IOS made by the supplier to exchange information with the buyer. This variable aims to cover different types of asset specificity such as physical (investments in the software and the hardware), procedural (efforts to integrate the supplier's IS with the buyer's IS), human (personnel training programs). The CFA suggests one factor construct (Cronbach's α = 0.887) that has four items:

- (Q13_1) the supplier invested extensively in their own IT competence (0.84),
- (Q13_2) the supplier invested extensively in IT systems by our standards and requirements (0.96),
- (Q13_3) the supplier invested substantially in the training of their employees (0.79),
- (Q13_6) made extensive investments to integrate their IT systems with our IT systems (0.69).

Chi-square = 1.316; degrees of freedom = 2; probability level = 0.518; CMIN/DF = 0.658; CFI = 1.00; NFI = .997; TLI = 1.00; RMSEA = 0.000.

The buyer IT specific investment (BITINV) describes the investments in the IOS made by the buyer for the purpose of collaboration with the supplier. Same types of the asset specificity have been used to describe the variable as for the SITINV variable. The CFA suggests one factor construct (Cronbach's α = 0.914) with four items:

- (Q15_2) Our company has invested in extensive internal training to learn the IT systems used with this supplier (0.80),
- (Q15_3) Our company has made extensive adaptations of our IT systems (0.93),
- (Q15_4) Our company has made substantial investments to integrate our IT systems with the supplier's systems (0.85),
- (Q15_5) Our company has made substantial investments in technical competence to support the IT system we use with this supplier (0.79).

Chi-square = 0.000; Degrees of freedom = 1; Probability level = 0.938; CMIN/DF = 0.006; CFI = 1.00; NFI = 1.00; TLI = 1.00; RMSEA = 0.000 (we allowed one error term to co-vary between items Q15_4 and Q15_5 in the single measurement model).

The ownership of the buyer's IT system (BUYITSYS) is a dummy variable, where "1" corresponds to the IOS being owned and controlled by the buyer. "0" value comprises other ownership options, for example, the supplier owning and controlling the system (1), the buyer and the supplier using the e-market system (2), the buyer and the supplier using an integrated IT system which is controlled by both parties (3), the buyer and the supplier using e-mail systems such as Microsoft Outlook for information exchange, which means that none of the parties owns and control the system (4).

The ownership of the supplier's IT system (SUPITSYS) is a dummy variable that is opposite to the BUYITSYS. Value "1" means that the buyer owns and controls the IOS. "0" value corresponds to the other ownership options which are listed in the paragraph above.

The product complexity (PRODCOMP) control variable consists of the following four items below (Cronbach's α = 0.846).

"The product we purchase from this supplier…

- (Q18_1) …is very complex",
- (Q18_4) …is technically complex to use",
- (Q18_5) …requires high level of expertise in production",
- (Q18_6) …is very difficult to specify".

Chi-square = 0.334; degrees of freedom = 2; probability level = 0.846; CMIN/DF = 0.167; CFI = 1.00; NFI = 0.999; TLI = 1.00; RMSEA = 0.000.

The operational electronic exchange (OPER) is a control variable which is derived from a broader construct electronic coordination (see above).

The supplier Industry Type (SUPPIND) and the length of IT cooperation with the supplier (LNITCOOP) variables, which are included in the model, however, are not subject to reliability tests.

We use the factor analysis to access the discriminant validity for 18 items which describe the following variables: COORD, OPER, SITINV, BITINV, and PRODCOMP. We used varimax rotation option for factor analysis. It suggested five factors. The factor loadings are presented in Tab. 1. Most researchers use the value of 0.6 as a cut-off point for factor loadings (Kim et al., 2010), although others, e.g. (Stevens, 1992), recommend values above 0.4. All factor loadings in Tab. 1, except for the item 11.9, are chosen above 0.6. As a result of the factor analysis, we removed items 18.2 and 18.3 for PRODCOMP variable, item 15.1 from BITINV variable, items 13.4 and 13.5 from SITINV variable. Loadings for the two variables COORD (11.4, 11.5, 11.6) and OPER (11.2, 11.3, 11.9) are reported from the three-factor solution for the electronic collaboration construct.

3. Specification of the regression model "IT system ownership – strategic electronic coordination"

We constructed an OLS-regression model in SPSS 22 software to test our hypotheses. The model looks as follows in (1).

$$\begin{aligned} COORD = {} & b_0 + b_1 \cdot BITINV + b_2 \cdot SITINV + b_3 \cdot BUYITSYS \\ & + b_4 \cdot SUPITSYS + b_5 \cdot BUYITSYS \cdot SITINV \\ & + b_6 \cdot SUPITSYS \cdot BITINV + b_7 \cdot SUPIND + b_8 \cdot OPER \\ & + b_9 \cdot LNITCOOP + b_{10} \cdot PRODCOMP + \varepsilon \end{aligned} \quad (1)$$

In (1), COORD is the strategic electronic coordination, BITINV is the buyer specific IOS investments, SITINV is the supplier specific IOS investments, BUYITSYS is the ownership of the buyer's IT system, SUPITSYS is the ownership of the supplier's IT system, SUPIND is the supplier's industry type, OPER is the operational electronic exchange, LNITCOOP is the length of IT cooperation with supplier, and PRODCOMP is the product complexity.

Based on Schoonhoven (1981), we took the partial derivative of the equation (1) to analyze hypotheses 1 and 2. For the hypothesis 1, we estimated the effect of the supplier specific IT investments on the strategic electronic coordination under the condition of the buyer's control and ownership of the IOS

Tab. 1. Rotated Component Matrix

	Components				
	1	2	3	4	5
18.1. Product is very complex	0.044	0.865	0.042	0.125	-0.108
18.4. Product is technically complex to use	-0.006	0.785	0.154	0.185	0.034
18.5. Product requires specific expertise	0.068	0.740	-0.007	0.071	0.052
18.6. Product specifications are very complex	-0.072	0.735	0.082	0.208	0.148
11.4. Collaboration over production plans	0.028	0.105	0.082	0.776	0.161
11.5. Collaboration over product/design	0.034	0.179	0.047	0.862	-0.123
11.6. Collaboration over development/testing	0.085	0.139	0.132	0.840	-0.007
11.2. Collaboration over ordering processes	0.052	0.013	0.024	0.056	0.844
11.3. Collaboration over invoicing/payment processes	0.140	0.049	0.180	0.164	0.698
11.9. Collaboration over replenishment systems	0.050	0.043	0.406	0.313	0.414
15.2. Buyer_ITspecinv_IT training for buyer's personnel	0.841	-0.045	0.241	0.041	0.051
15.3. Buyer_ITspecinv_upgrading IT systems	0.885	0.112	0.158	-0.037	0.079
15.4. Buyer_ITspecinv_integrate buyer/supplier's IT systems	0.876	0.188	0.111	0.027	0.017
15.5. Buyer_ITspecinv_technical skills for operating IT system	0.841	0.139	0.159	0.063	-0.009
13.1. Supp_ITspecinv_upgrading IT skills	0.191	0.011	0.850	0.074	-0.014
13.2. Supp_ITspecinv_IT systems	0.216	0.047	0.876	0.097	0.068
13.3. Supp_ITspecinv_training supplier's personnel for e-coord	0.197	0.117	0.825	0.213	0.132
13.6. Supp_ITspecinv_reorg internal routines	0.162	0.083	0.773	0.159	0.168

Note: extraction method: Principal Component Analysis, rotation method: Varimax with Kaiser Normalization, rotation converged in 5 iterations.

$$\frac{\partial COORD}{\partial SITINV} = b_2 \cdot + b_5 \cdot BUYITSYS \quad (2)$$

$$\frac{\partial COORD}{\partial BITINV} = b_1 \cdot + b_6 \cdot SUPITSYS \quad (3)$$

(equation (2)). For the hypothesis 2, the effect of the buyer specific IT investments on the strategic electronic coordination was estimated under the condition of the supplier's full control and ownership of the IOS system (equation (3)).

According to H1, more extensive strategic electronic coordination is expected when the supplier increases the level of investments in the IOS under the condition of the buyer's ownership and control over the IOS rather than under the condition of other types of the IOS ownership.

According to H2, more extensive strategic electronic coordination is expected when the buyer increases the level of investments in the IOS under the condition of the supplier's ownership and control over the IOS rather than under the condition of other types of the IOS ownership.

4. Results

We tested our model for heteroscedasticity. The test demonstrated that no heteroscedasticity had been found (F = 0.525; p = 0.871). The correlation matrix and the descriptive statistics are presented in Tab. 1 and 2, respectively. The goodness of fit of the model is deemed acceptable, R^2Adj = 0.258 (F = 7.316; df = 10; p = 0.000). We also tested the significance of the two interaction effects to answer the question whether they add any explanatory power to the regression model (Akien & West, 1991). For that purpose, we used a hierarchical multiple regression. The results show that the interaction effect described in Hypothesis 1 provides 2.1% improvement to the goodness of fit of the model. This improvement is significant at p = 0.027 (F = 5.000; df = 1). For Hypothesis 2, the interaction effect improves the goodness of fit by 2%. The improvement is significant at p = 0.031 (F = 4.712; df = 1).

The regression analysis results (Tab. 3) supports hypothesis 1 and hypothesis 2. The impact of the interaction effect between the supplier specific IOS investments and the ownership of the buyer's IT system on the strategic electronic collaboration (hypoth-

Tab. 2. Correlations matrix

		COORD	SITINV	BITINV	BUYITSYS	SUPITSYS	BITINV × SUPITSYS	SITINV × BUYITSYS	SUPIND	OPER	LNITCOOP	PRODCOMP
COORD	Pearson Corr-n	1	0.240	0.109	-0.084	-0.069	0.203	0.246	0.270	0.336	0.133	0.289
	Sig. (1-tailed)		0.000	0.064	0.121	0.168	0.002	0.000	0.000	0.000	0.035	0.000
	N	198	198	197	198	198	198	198	193	198	186	198
SITINV	Pearson Corr-n	0.240	1	0.451	0.035	-0.076	0.093	0.520	-0.106	0.389	0.040	0.117
	Sig. (1-tailed)	0.000		0.000	0.310	0.143	0.096	0.000	0.071	0.000	0.292	0.050
	N	198	198	197	198	198	198	198	193	198	186	198
BITINV	Pearson Corr-n	0.109	0.451	1	-0.023	-0.060	0.450	0.275	-0.208	0.222	0.094	0.127
	Sig. (1-tailed)	0.064	0.000		0.375	0.199	0.000	0.000	0.002	0.001	0.102	0.037
	N	197	197	197	197	197	197	197	192	197	185	197
BUYIT SYS	P Pearson Corr-n	-0.084	0.035	-0.023	1	-0.289	0.031	0.051	0.075	0.081	0.111	0.056
	Sig. (1-tailed)	0.121	0.310	0.375		0.000	0.332	0.236	0.151	0.128	0.065	0.217
	N	198	198	197	198	198	198	198	193	198	186	198
SUPIT SYS	Pearson Corr-n	-0.069	-0.076	-0.060	-0.289	1	-0.107	-0.015	-0.177	-0.178	-0.079	-0.190
	Sig. (1-tailed)	0.168	0.143	0.199	0.000		0.066	0.418	0.007	0.006	0.143	0.004
	N	198	198	197	198	198	198	198	193	198	186	198
BITINV × SUPIT SYS	Pearson Corr-n	0.203	0.093	0.450	0.031	-0.107	1	0.002	0.044	0.108	-0.001	0.116
	Sig. (1-tailed)	0.002	0.096	0.000	0.332	0.066		0.491	0.271	0.065	0.497	0.052
	N	198	198	197	198	198	198	198	193	198	186	198
SITINV × BUYIT SYS	Pearson Corr-n	0.246	0.520	0.275	0.051	-0.015	0.002	1	-0.074	0.267	0.007	0.073
	Sig. (1-tailed)	0.000	0.000	0.000	0.236	0.418	0.491		0.155	0.000	0.461	0.153
	N	198	198	197	198	198	198	198	193	198	186	198
SUPIND	Pearson Corr-n	0.270	-0.106	-0.208	0.075	-0.177	0.044	-0.074	1	0.050	0.141	0.267
	Sig. (1-tailed)	0.000	0.071	0.002	0.151	0.007	0.271	0.155		0.244	0.028	0.000
	N	193	193	192	193	193	193	193	193	193	184	193
OPER	Pearson Corr-n	0.336	0.389	0.222	0.081	-0.178	0.108	0.267	0.050	1	0.176	0.098
	Sig. (1-tailed)	0.000	0.000	0.001	0.128	0.006	0.065	0.000	0.244		0.008	0.086
	N	198	198	197	198	198	198	198	193	198	186	198
LNIT COOP	Pearson Corr-n	0.133	0.040	0.094	0.111	-0.079	-0.001	0.007	0.141	0.176	1	0.267
	Sig. (1-tailed)	0.035	0.292	0.102	0.065	0.143	0.497	0.461	0.028	0.008		0.000
	N	186	186	185	186	186	186	186	184	186	186	186
PROD COMP	Pearson Corr-n	0.289	0.117	0.127	0.056	-0.190	0.116	0.073	0.267	0.098	0.267	1
	Sig. (1-tailed)	0.000	0.050	0.037	0.217	0.004	0.052	0.153	0.000	0.086	0.000	
	N	198	198	197	198	198	198	198	193	198	186	198

esis 1, Fig. 1) is positive and significant (b_5 = 0.402; t = 2.475; $p < 0.05$). The interaction effect between the buyer's specific IOS investments and the ownership of the supplier's IT system (hypothesis 2, Fig. 2) is also positive and significant (b_5 = 0.406; t = 2.416; $p < 0.05$).

Notably, the plots of the two interaction effects have similar shapes (Fig. 1 and 2). A steep slope of the two diagrams demonstrates a strong impact of both addressed interaction effects on the strategic electronic coordination. The observed similarity in the shape of two plots (i.e., close values of the coefficients b_5 and b_6) points to the applicability of

Tab. 3. Descriptive statistics

Variables	N	Mean	Standard Deviation
COORD	198	2.9084	1.48514
SITINV × BUYITSYS	198	0.0206	0.70005
BITINV × SUPITSYS	198	-0.0346	0.64144
BITINV	197	2.6586	1.43322
SITINV	198	2.8436	1.34618
BUYITSYS	198	0.2500	0.43300
SUPITSYS	198	0.2000	0.40300
PRODCOMP	198	3.0510	1.48319
OPER	198	4.3316	1.41242
SUPIND	193	0.3500	0.47700
LNITCOOP	186	1.2766	0.77164

the developed theoretical framework to both hypotheses. It is also necessary to point to the negative sign of coefficient b_1. This coefficient describes the direct effect BITINV has on COORD. The resulting setting where b_1 has a negative value and, simultaneously, b_2 assumes a positive value, may indicate that the significance of the IOS ownership mechanism for the considered coordination problem is much higher for the buyer than for the supplier. In other words, the buyer can avoid the negative correlation between BITINV and COORD if the buyer's IOS investments are complemented with other tools or actions. In our model, the IOS ownership is suggested as one of such tools.

The direct effect of all the independent variables which produce the two examined interaction effects is statistically insignificant: BITINV (b_1 = -0.068; t = -0.770; p = 0.442); SITINV (b_2 = 0.073; t = 0.787; p = 0.432). The insignificance of SITINV and BITINV variables in our model can be attributed to that fact that the IT investments only lead to the desired outcomes when both parties in the dyad invest in a common IT system simultaneously or if the IT investments are coupled with such factors as, for example, trust (Ibbott & O'Keefe, 2004) or power-dependency structures (Allen et al., 2000). Dummy variables that are included in the two interaction effects have neither demonstrated a strong statistical significance in our model. One variable (namely, BUYITSYS), however, may be regarded as somewhat significant at $p < 0.1$ (b_3 = -0.465; t = -1.977).

The control variables OPER, PRODCOMP, SUPIND demonstrate the expected effects on COORD:

- OPER (b_8 = 0.250; t = 3.302; p = 0.001),
- PRODCOMP (b_{10} = 0.192; t = 2.725; p = 0.007),
- SUPIND (b_7 = 0.684; t = 3.105; p = 0.002).

The control variable LNITCOOP is found statistically insignificant in our model (b_9 = 0.047; t = 0.350; p = 0.727).

Conclusions

The obtained research results presented in this paper contribute to one of the main streams in the supply chain literature, namely, the literature discussing the issues of coordination. Also, certain advice for top- and middle-level managers responsible for information-sharing decisions is proposed.

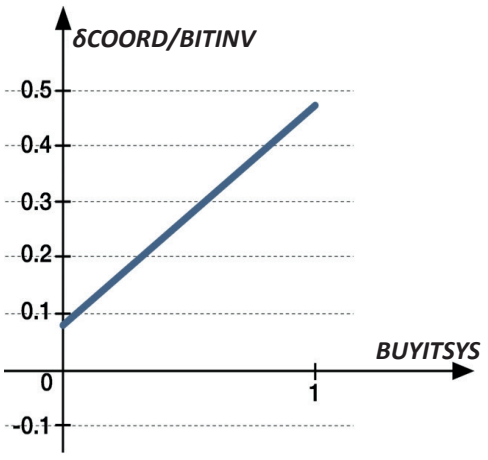

Fig. 1. Interaction effects for the two hypotheses (H1)

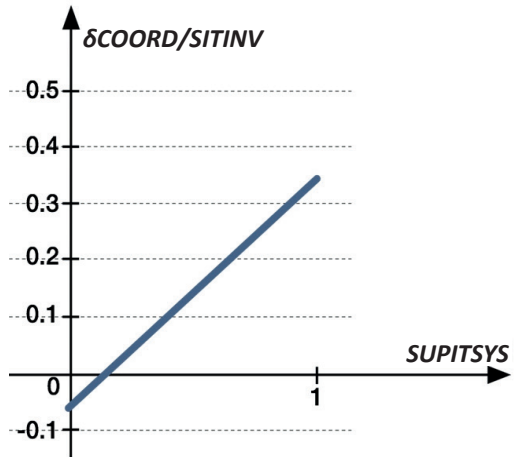

Fig. 2. Interaction effects for the two hypotheses (H2)

Tab. 4. Regression analysis

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.691	0.216		12.448	0.000
BITINV	b_1 = -0.068	0.089	-0.065	-0.770	0.442
SITINV	b_2 = 0.073	0.093	0.066	0.787	0.432
BUYITSYS	b_3 = -0.465	0.235	-0.134	-1.977	0.050
SUPITSYS	b_4 = 0.151	0.254	0.041	0.594	0.553
BUYITSYS×SITINV	b_5 = 0,402	0.162	0.188	2.475	0.014
SUPITSYS×BITINV	b_6 = 0.406	0.168	0.181	2.416	0.017
SUPIND	b_7 = 0.684	0.220	0.218	3.105	0.002
OPER	b_8 = 0.250	0.076	0.235	3.302	0.001
LNITCOOP	b_9 = 0.047	0.134	0.024	0.350	0.727
PRODCOMP	b_{10} = 0.192	0.071	0.191	2.725	0.007

Note: dependent variable: COORD.

These two aspects are addressed in the discussion of the following two subsections concluding this paper.

The primary goal of this research was to offer new theoretical insights into the inter-organisational electronic exchange of strategic information, as well as to find new explanatory factors and drivers for this information sharing. An interesting observation we found is that the direct effects of the supplier's investments in the IOS and the buyer's investment in the IOS are not statistically significant. It may be attributed to the specific nature of the IOS investments, i.e., they become beneficial only when both sides contribute to the IOS investment projects equally. Due to the high specificity of the IOS investments, especially when it comes to customized IOSs, specific investments made unilaterally become a too risky option. That is explained by high switching costs which in turn originate from a high risk of opportunism from the non-investing party. Our modelling results substantiate that point. Neither the buyer's nor the supplier's investments made unilaterally may contribute to the electronic strategic collaboration. However, from a theoretical standpoint, the goal of any specific investment type is to contribute to the growth of value and to reduce costs. We see that the impact of the unilaterally made IOS investments becomes statistically significant (Tab. 4) in case of mutual investments in the IOS when reciprocity is established. Our results demonstrate that the IOS ownership mechanism can have a significant impact on the relationship "IOS specific investments – strategic electronic coordination" by eliminating the threat of the opportunistic behaviour.

The fact that one of the companies in the dyad owns and controls the IOS normally describes the situation when this firm initiates the IOS project and, therefore, makes significant investments in the IOS, i.e., pays for hardware and software, spends time on searching and contracting potential software vendors, and trains personnel. The other party of the IOS investments basically has to adjust their IT system to the one established by the company who made the essential IOS investment (the one owning and controlling the system). In such a case, both sides of the IOS project may find themselves in a "win-win" situation where, first, the supplier does not bear any risk of losing significant funds invested in the IOS in case the relationships are prematurely terminated. In the meantime, the buyer is not afraid to lose the invested funds because the supplier has very little incentive to behave opportunistically (the buyer owns the IOS and can use the supplier's sensitive strategic information for its purposes, which can easily prevent the supplier from using the IOS). There may be situations when the same IOS is shared with other suppliers, so the risk of "locked-in" situation is then reduced to the minimum.

The described mutually beneficial situation might become motivating for sharing strategic information. It may also be a solution to the "information exchange paradox" (Bogers, 2011), when both parties in the dyad understand the importance and the value that information exchange brings to the table; however, they choose not to share the information due to fear of the information being inappropriately used by other companies for their economic gains.

Notably, the values of the coefficients describing the two interaction effects (Tab. 2) are rather similar, and both are considerably higher than zero. It makes the slope of the two interaction effects appear steep (Fig. 1 and 2). This quality remarkably substantiates what prompts the companies to exchange their sensitive strategic information. These two effects, in other words, explain the conditions that increase the willingness to share information via an IOS. Interestingly, the effect of BITINV on COORD is negative, all the while the results prove this correlation to be not statistically significant (Tab. 2). From the buyer's viewpoint, this fact merely points to the value of knowing who owns the IOS, since this knowledge becomes a determinant in the buyer's decision whether to get involved in the coordination with a particular supplier or not.

It should also be noted that the theoretical implications are limited to the five different IOS ownership structures implicated in the used questionnaire. Nowadays, companies often use cloud solution to share information with their partners. These new approaches can be cheap and time-effective, although they may bear certain kinds of risks. The cloud solutions have not been considered in our model because the data for this research was collected in 2006 when these solutions were at an early stage of their development.

Some remarks are necessary regarding the control variables. The impact of OPER, PRODCOMP, and SUPIND on COORD is positive as expected and statistically significant. The impact of LNITCOOP on COORD is not statistically significant. In section 1.2, we point out that many researchers examine the duration of the prior relationships as a variable and find that it has no impact on cooperation.

The modelling results underline the importance of the ownership mechanism of an IOS. Managers who make decisions regarding the information that can and should be shared with partners are likely to benefit from avoiding the overly sceptical attitude to the information exchange and, thereby, the cautious behaviour when the hostage situation is observed in the dyad. It means that if the reciprocal investments are made in an IOS, and afterward certain managerial decisions block the flow of the strategic information between the firms (due to the fear of the other party's opportunism), then a negative impact on the dyad's collaboration goals, and by extension, the supply chain performance are to be expected in the long run. In such a case, the potential gains of a company striving to protect itself from the other firms' opportunism (i.e., sensitive information disclosure to the third parties or competing agents) may be lower than the potential benefits from the extensive sharing of various information within the dyad.

The results of the presented modelling prompt neither the buyer nor the supplier to share all their strategic information with each other. The IOS ownership is only one out of many antecedents of the strategic information exchange. To decide regarding the types of information to be exchanged with a specific partner, the broader perspective of various business aspects and market conditions should be contemplated. Our research model shows that the product complexity has a significant impact on the strategic collaboration. We may assume that for the products of a rather low complexity level, the significance of the examined hypotheses may be annihilated. Therefore, when it comes to the decision-making about the types of information to be exchanged, the managers should always conduct a multi-criteria analysis of the supply chain and the market conditions (where the IOS ownership is one of many factors).

One of the presented research limitations is the focus on the Norwegian companies. The IOS ownership structures may have a different impact on the coordination in different cultural environments in various countries.

Also, in this paper, we have collected the data from the buyer's perspective. We could expect a result that is possibly diverging from the one obtained here if the same questions regarding the IT-specific investments were directed to the suppliers.

Our research concentrates exclusively on the dyadic relationship. Much more complex models, structures, and results could have been obtained if three or more actors were included in the analysis. That, however, may pose a problem due to the lack of relevant scientific frameworks as well as the issues regarding data collection.

In this research, the CFA has suggested including only three items in the construct of "Strategic electronic coordination". It appears obvious that the scope of information to be potentially exchanged in real dyadic relationships may turn out to be much broader than that specified by the three items in our model. In the future research, more items describing the strategic electronic coordination may be suggested to provide a more precise description of the phenomenon in question.

In our results, the R-square characteristic of our model has a moderate value. Had more antecedents (i.e., independent variable) been identified and included into consideration, a higher value of R-square may have been expected.

New forms of the IOS collaboration, such as cloud solutions, have not been considered in this model. Elaborating such an analysis as the one presented in this paper with these modern approaches would require formulating and testing new hypotheses, updating the questionnaire for the data collection purposes, and most importantly, exploring the theoretical foundations for the new results that may be expected.

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Small business life cycle: statics and dynamics (S&D) model

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ABSTRACT
The aim of the paper is the presentation of theoretical foundations and the structure of original, 8-stage statics and dynamics model in the small business life cycle. Based on theoretical considerations, two hypotheses concerning the impact of dynamic and static nature of the life-cycle stages on selected determinants and effects of SMEs' development were formulated. The hypotheses were verified based on the results of the survey conducted on a sample of 1,741 SMEs from 22 countries of the European Union. The results indicate that companies in the dynamic life-cycle stages are run by more enterprising owners, operate in more promising markets with a higher potential and make greater use of market niches thus limiting the level of competition. At the same time, such companies are characterised by higher levels of flexibility and involvement in innovative activities, which translates into obtaining a significantly higher level of business performance, in the area of quantitative as well as qualitative results.

KEY WORDS
small business, micro, small and medium-sized enterprises, business life cycle, business performance

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Introduction

Organisational life cycle models are a group of useful management tools employed for description, interpretation and prediction of the course of business development stages. Many models consider the specificity of small business. This specificity primarily includes the focus on the initial stages of the life cycle, and also assumes the existence of changes that lead to leaving the population of micro, small and medium-sized enterprises (SMEs), and transitioning to the class of large enterprises (LEs). This enables the determination of development stages specific to small business. One of the criteria for their determination may be the division into the static and dynamic stages, which expresses the diversity

observed in the intensity of development processes, market activity and the investment scope.

Based on the above, the aim of the paper is the presentation of theoretical foundations and the structure of original, 8-stage statics and dynamics model in the small business life cycle. Two research hypotheses were formulated. The results of the survey aimed at the description and interpretation of selected determinants and effects of SMEs' development processes in dynamic and static life-cycle stages, were used for the empirical illustration of the considerations. The research was conducted on a sample of 1,741 micro, small and medium-sized enterprises from 22 countries of the European Union. The results indicate that companies in the dynamic life-cycle stages are run by more enterprising owners, operate in more promising markets with a higher potential and make greater use of market niches thus limiting the level of competition. At the same time, such companies are characterised by higher levels of flexibility and involvement in innovative activities, which translates into obtaining a significantly higher level of business performance, in the area of quantitative as well as qualitative results.

1. Literature review

Organisational life cycle (OLC) models are used to describe, interpret and predict the course of development stages of modern enterprises. In terms of the concept, they are derived from the theory of biological determinism, interpreting organisational reality with the use of perception specific to the natural world (Samuel, 2012). Due to this fact, these models allow a metaphorical comparison of organisations to living organisms that are born, grow, develop, go through certain changes in life, and then die. Thus, OLC models accentuate volatility and relative impermanence of economic organisations, at the same time stressing the dynamic nature of development processes occurring in modern enterprises.

There are many proposed stage models of the organisational life cycle in management sciences. Based on the literature review of 1962-2006, Levie and Lichtenstein (2010) identified 104 such models, covering from 2 to 11 stages (m = 4.3). Tam and Gray (2016) focused on the existing theoretical achievements in the field of OLC models encompassing more than sixty years and synthesised them into four major periods: primitive (the 1950s-1960s), contextual (the 1970s), enhanced (the 1980s), and validated (the 1990s and beyond). In each of these periods, both the number and complexity of the proposed models increased, offering additional cognitive values and applications.

The substantive justification of OLC models is derived from the concept of the s-curve model introduced into economic sciences by Griliches (1957) and developed by Mansfield (1961). The general form of the model is represented by the proposal formulated by Jackson and Morgan (1982) which expresses the general model of the social systems development cycle involving the following successive stages:

- creation and expansion,
- stabilisation and dynamic equilibrium,
- change or decline and dissolution.

Some of the proposed OLC models consider the specificity of small business, which is especially useful for description, interpretation and prediction of development processes of micro, small and medium-sized enterprises. 125 million of SME companies play a significant social and economic role in most developed and developing countries (Kushnir, Mirmulstein & Ramalho, 2010). They are also essential for the success and development of the European Union (Lukács, 2005; Autio, 2016), where they build efficiency and competitiveness of economy as the main source of new jobs and innovative ideas related to entrepreneurship and economic activity (Floyd & McManus, 2005). To distinguish SMEs out of the entire population of business entities, specific quantitative and qualitative criteria are used. In the European Union, these criteria are formulated in the form of a uniform, formal definition adopted by the European Commission (2015). This definition sets the upper limits of small business quantitative criteria to 249 employees (FTE) and an annual turnover at the level of EUR 50 million or a balance sheet total of EUR 43 million. In addition, the definition considers capital and/or ownership ties between SMEs and other enterprises which may influence the final level of the criteria adopted for the analysis of company size.

The classification criteria of micro, small and medium-sized enterprises are the basis for the substantive identity of small business (Nicolescu, 2009; Storey & Greene, 2010) reflected in OLC models dedicated to SMEs. Lester, Parnell and Carraher (2003) point out that these models should be based on the use of certain sub-stages that express the specificity of small business. In their opinion, a description of SMEs' development processes is best

reflected in the initial stages of the life cycle, to which special attention should be paid in the case of OLC models dedicated to small business. The remaining key distinguishing substantive features of stage life-cycle models of SMEs include:

- complementing and expanding the small business start-up stage through the inclusion of the conceptual stage (pre-emergence), in which the preparation of the concept of market activities of the new company occurs (Felsenstein & Swartz, 1993);
- emphasising the role of entrepreneurship and the business owner's attitude as key determinants of success in the small business life cycle (Adizes, 1988);
- rejecting an absolutely deterministic course of the life cycle and accepting a non-linear course of the stages that assume the return to the initial stages (Churchil & Lewis, 1983) as well as the above average growth bypassing the intermediate stages (Granlund & Taipaleenm, 2005);
- acknowledging the possibility of the use of reconfiguration and organisational renewal to counter crisis phenomena, prevent the decline stage and allow an effective continuation of business activity (Belussi & Sedita, 2009);
- considering the possibility of leaving the population of SMEs by separating the ownership and management, or by a merger with another company, aimed at further market expansion already in the population of LEs (Jones, 2009).

Based on the existing OLC models and considering the criticisms formulated against these models (Phelps, Adams & Bessant, 2007), an original stage of the dynamics and statics model of SMEs' life-cycle was proposed. Its substantive scope covers eight stages relating to the qualitative specificity of small business (Matejun, 2013):

- the pre-emergence stage of conceptual nature, aimed at the decision about setting up the company;
- the emergence stage, in which first investments and first attempts at developing and commercialising the company's market offer based on entrepreneurial activity are made;
- the survival stage, which is a period of the first market verification of the company and of a challenge related to ensuring the required level of profitability and liquidity;
- the dynamic growth stage, in which the following quantitative growth indicators significantly increase: turnover, the level of employment or the number of contractors, accompanied by the introduction of proactive qualitative changes in the company;
- the separation and expansion stage, in which important expansion activities in the area of market, product or investment are carried out, and the authority is often passed into the hands of professional managers;
- the stabilisation stage, in which the dynamics of business growth is reduced, accompanied by stabilisation of financial indicators, reduction in investment and growth of the organisation;
- the revitalisation stage, characterised by a dynamic and proactive approach to the company's further development based on the introduction of significant changes in the company's structure, business strategy and market offer;
- the decline stage, characterised by a rather permanently reduced level of efficiency and effectiveness, as well as negative financial results, which may lead to the collapse of the company.

An innovative approach expressed in the proposed model assumes, on the one hand, a clear substantive differentiation of the life cycle stages, and, on the other hand, includes the search for similarities between the different stages. These similarities express a specific approach to business development and business activity. It is worth noting that some of the stages are characterised by a proactive approach to business activity and focusing efforts on the market, investment and development processes. Such stages are set out in the model as the dynamic development stages. Their opposites are the static stages, characterised by more conservative and stable actions focused on current activities and ensuring the continuity of the company. Masurel and van Montfort (2006) came to similar conclusions considering the similarity of the life cycle stages in relation to such indicators as sales diversification, diversity of the workforce, or productivity. Their analysis of similarities, however, concerns only the initial stages, as well as the business maturity and decline stages.

In the proposed S&D life cycle model, all the stages are divided into static and dynamic ones from the point of view of the proactive approach to development activity. However, this division is not absolute as it includes the identification of specific systems of static and dynamic antitheses, as shown in Tab. 1.

At the same time, the proposed S&D life cycle model assumes a departure from the deterministic approach, typical of previous models, according to which a company passes linearly through all the sub-

Tab. 1. Static and dynamic antitheses in the proposed S&D life cycle model

Static stages	Antithesis	Dynamic stages
The pre-emergence stage The survival stage	↔	The emergence stage
The stabilisation stage	↔	The dynamic growth stage
The decline stage	↔	The separation and expansion stage The revitalisation stage

sequent development stages. The linear process of development only applies to the first three stages, and then SME managers can to a large extent control the development of enterprises with the right concepts and management methods aimed at the effective use of internal resources and the potential of the external environment in business development processes. Thus, different combinations of the order of the life cycle stages are possible. Errors in the management area will mostly result in shifting in the direction of the static stages, while effective management solutions will provide a basis for growing dynamics of development processes. As a result, the model does not assume a single, universal development path, as each company has its own, unique life cycle. Although the model primarily includes the specificity of small business, it also considers the possibility of a company's transition to the group of large enterprises. The subsequent growth is most often the continuation of the dynamic growth stage or the separation and expansion stage. The explanation of the further stages of development of thus transited enterprises requires the use of other OLC models which consider the specificity of LEs.

Fig. 1 shows the graphical form of the proposed S&D life cycle model.

The proposed model can, therefore, be a useful and powerful managerial tool explaining the specificity of causes and determinants, as well as the course of small business development processes. A key challenge in this respect, however, is confirmation of theoretical assumptions concerning the diversity of selected determinants and effects of SME development, considering the dynamics and statics resulting from the proposed S&D life cycle model. Since the model assumes that the dynamic stages are characterised by a proactive approach to development processes, the hypothesis H1 was formulated. It assumes that SMEs operating in the dynamic stages of the S&D life cycle model are characterised by higher levels of the potential of internal development factors and more positively perceive the potential of their business environment. Their higher growth potential should be reflected in the results of the conducted business activity. Based on the above, the hypothesis H2 was formulated. It assumes that SMEs operating in the dynamic stages of the S&D life cycle model achieve higher business performance than SMEs operating in the static stages. The empirical studies presented further in the paper serve the verification of the formulated hypotheses.

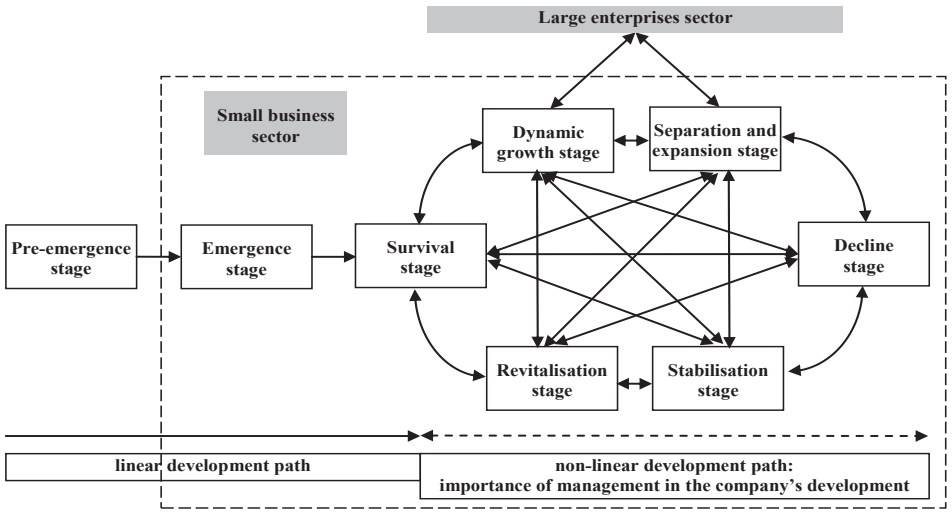

Fig. 1. Graphical form of the proposed S&D life cycle model

2. Research methods

To present the possible use of the S&D life cycle model to describe and interpret the course of small business development processes, a survey was conducted on a sample of 1,741 SME companies. The CSAQ – Computerised Self-Administered Questionnaire – was used as the research technique (Bryman & Bell, 2015). The research tool was the original survey questionnaire available to respondents on www.questionpro.com.

In view of the fundamental importance of small business for the socio-economic development of the European Union, the study covered 22 selected countries in the EU: Austria, Belgium, Bulgaria, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Great Britain, Greece, Hungary, Italy, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden. Statistical data from European Union (2016) and the European Commission (2016) show that there are more than 21 million enterprises in this area, of which over 98% are SMEs. According to the World Bank indicators (2016), the research area covers more than 4 million sq. km (more than 95% of the area of the EU) and is inhabited by nearly 500 million people (98% of the population of the EU).

The size of the companies surveyed was established based on the answers provided by the respondents to the questions in the survey questionnaire concerning annual average employment levels (FTE), the level of turnover (LoT), and the balance sheet total (BST). The quantitative levels for each of the criteria were adopted based on the formal, uniform SME definition provided by the European Commission (2015) and applicable throughout the European Union. As a result, it was possible to determine 1,183 micro companies, 399 small companies and 159 medium-sized companies in the sample. Also, all the surveyed entities were autonomous enterprises, i.e. they were completely independent in terms of capital and/or ownership from other entities or had one or more minority partnerships (each less than 25%) with other enterprises.

Most of the companies surveyed operate as sole proprietorships run by individual owners (45%) or as limited liability companies (35%). These are companies operating primarily in the service sector (60%), fewer in the manufacturing (21%) or trade sectors (19%). Most of the surveyed companies (73%) are active at least in the domestic market. The sample included entities with a relatively long period of market activity, of more than 20 years (36%) or from 5 to 10 years (21%). Detailed characteristics of the companies surveyed are shown in Tab. 2.

The empirical material concerning the surveyed SMEs was collected based on the opinions and observations of the respondents. The respondents were primarily business owners (74%), higher level managers (19%) or employees authorised and legitimised by the management to participate in the study (7%).

Tab. 2. Detailed characteristics of the surveyed SMEs

Company size	n	[%]	Legal form of the company	n	[%]
Micro (up to 9 employees, LoT and BST up to EUR 2 million)	1183	67.9	Individual company	775	44.5
Small (up to 49 employees, LoT and BST up to EUR 10 million)	399	22.9	Private partnership	232	13.3
Medium (up to 249 employees, LoT up to EUR 50 million and BST up to EUR 43 million)	159	9.1	Limited liability company	614	35.3
Sector of market operations	**n**	**[%]**	Joint stock company	96	5.5
Service	1043	59.9	Cooperative	15	0.9
Trade	335	19.2	Foundation	7	0.4
Production	363	20.9	Other	2	0.1
Company age	**n**	**[%]**	**Range of market operations**	**n**	**[%]**
Up to 5 years	198	11.4	Local	116	6.7
Over 5 to 10 years	368	21.1	Regional	347	19.9
Over 10 to 15 years	305	17.5	National	676	38.8
Over 15 to 20 years	240	13.8	International	479	27.5
Over 20 years	630	36.2	Global	123	7.1

The questions were mostly answered by men (70%), aged 31 to 40 years (30%) or over 50 years (35.5%), with higher education (81%), technical education (40%) or economic/management education (26%).

Based on the empirical material collected, a statistical analysis was conducted using IBM SPSS Statistics (Field, 2014). The following statistical methods were used (Swift & Piff, 2014; Weinberg & Abramowitz, 2015): count analysis, mean, Spearman's (rs) correlation coefficient and its significance test, Student's t-test with the additional inclusion of Levene's Test of Equality of Variances. To measure most variables, the VAS – Visual Analogue Scale – was used (Reips & Funke, 2008). The level of reliability of the adopted measurement scales was assessed with the use of Cronbach's alpha coefficient (Cronbach & Shavelson, 2004), for which an acceptable level in the range from 0.7 to 0.9 was adopted. To assess the strength of the interdependence of the phenomena, an approach based on the proposal formulated by Cohen (1992) was used, taking as the thresholds of the linear correlation coefficient the following correlation levels: 0.1 – weak; 0.3 – medium; 0.5 – strong, 0.7 – very strong.

3. Research results and discussion

In the first stage of empirical work, the range of occurrence of static and dynamic stages of the life cycle in the studied sample was analysed. Their identification was made based on indications (declarations) of the respondents who in the survey questionnaire were to indicate one stage which was best suited to the current market situation of their companies. To increase the precision of the responses, each stage was accompanied by a description corresponding directly to its theoretical characteristics. Since the study involved only functioning companies, the range of the S&D life cycle model was narrowed down to 7 stages, excluding the pre-emergence stage from the research. The respondents frequently pointed out that the companies surveyed were in the stabilisation stage (29%) or the dynamic growth stage (26%). Most of the respondents declared operating in the static stages of the life cycle (53%), but small and medium-sized companies more often indicated operating in the dynamic stages. The results indicate that the dynamics of the life cycle stages is, therefore, positively and significantly related to the size of the companies surveyed, $rs\ (N = 1741) = 0.14$, $p < 0.01$. The level of correlation indicates a very weak relationship between these variables. Detailed information on the declared life cycle stages of the companies surveyed, including the breakdown into the static and dynamic stages, is shown in Tab. 3.

The further part of the research focused on the description and interpretation of selected determinants and effects of development processes in the companies surveyed with the use of dynamics and statics resulting from the life cycle stages. The following areas were chosen for the analysis of development determinants:

- the business owner's entrepreneurship, which was established based on the classical approach to defining entrepreneurship proposed by Roberts et al. (2006) and Hisrich, Peters and Shepherd (2016). For its operationalisation, a synthetic index (4 items) was used including the focus on the identification of market opportunities, openness to cooperation with the environment, the owner's positive self-assessment and convic-

Tab. 3. Life cycle stages in the companies surveyed according to the S&D model

Life cycle stage	Total in the sample		Micro companies		Small companies		Medium companies	
	N	[%]	N	[%]	N	[%]	N	[%]
Emergence stage	32	2	30	3	2	1	0	0
Survival stage	305	18	259	22	39	10	7	4
Dynamic growth stage	447	26	278	23	114	29	55	35
Separation and expansion stage	50	3	17	1	18	5	15	9
Stabilisation stage	499	29	320	27	136	34	43	27
Revitalisation stage	288	17	178	15	73	18	37	23
Decline stage	120	7	101	9	17	4	2	1
Static stages in total:	924	53	680	57	192	48	52	33
Dynamic stages in total:	817	47	503	43	207	52	107	67

tion about the effectiveness of actions undertaken, as well as taking calculated business risks. The individual items were assessed using the VAS in the range from 0 (completely does not apply to the owner) to 100 (fully applies to the owner). The level of alpha Cr. for this variable amounted to 0.868;

- organisational flexibility, as one of the key factors of small business development. For its operationalisation, a synthetic index (4 items) was used based on Verdú-Jover, Lloréns-Montes and García-Morales (2006) and including the ability to modify the organisational and employment structure depending on development needs, having a resource surplus that allows to carry out dynamic development activities aimed at anticipating market trends and exploiting market opportunities. The individual items were assessed using the VAS in the range from 0 (completely does not apply to the company) to 100 (fully applies to the company). The level of alpha Cr. for this variable amounted to 0.829;
- involvement in innovative activities, i.e. the ability to conduct innovative activities. For its operationalisation, a synthetic index (3 items) was used based on Edwards, Delbridge and Munday (2005) and Ahedo (2010) including the focus on innovative activities, an adaptation of innovative activities conducted to market needs, as well as the level of creative attitudes and behaviour of company employees. The individual items were assessed using the VAS in the range from 0 (completely does not apply to the company) to 100 (fully applies to the company). The level of alpha Cr. for this variable amounted to 0.754;
- perceived conditions of the small business environment, described with the use of two selected simple indicators: (1) intensity of competition in the industry, and (2) prospects of the industry development. Each one was evaluated using the VAS in the range from 0 (very low level) to 100 (very high level). Also, the respondents were asked about the competition arena in which the company operates (Porter, 2008) with the possibility of indicating (1) a market niche or (2) a wide arena of competition.

The assessment of development effects includes the company's performance, which was determined based on proposals by Murphy, Trailer and Hill (1996) as well as Aragón-Sánchez and Sánchez-Marín (2005), assuming the inclusion of 2 dimensions, namely, quantitative and qualitative. For its operationalisation, a synthetic index (8 items) was used including the level of revenue, return on investment, market share, productivity, quality and the ability to expand the offer of products and services, teamwork and CSR. The individual items were compared to the performance of major competitors (Koh et al., 2007) and assessed on the VAS scale in the range from 0 (much worse than competitors) to 100 (much better than competitors). The level of alpha Cr. for this variable amounted to 0.798. The construction of this index also allowed the determination of two subvariables: quantitative and qualitative business performance. Tab. 4 shows descriptive statistics for each of the determinants and effects of development processes in the companies surveyed.

The next part of the study analysed the existence of differences in the assessment of individual development determinants and processes of the companies surveyed from the point of view of dynamics of the life cycle stages. Student's t-test considering Levene's Test of Equality of Variances was used, and the results are presented in Tab. 5.

Tab. 4. Descriptive statistics of the analysed determinants and effects of development processes of the surveyed companies

Variable	Total in the sample	Micro companies	Small companies	Medium companies
Owner's entrepreneurship	71	70	74	79
Organisational flexibility	52	50	56	60
Involvement in innovative activities	55	54	57	63
Intensity of competition in the industry	74	74	73	76
Prospects of industry development	62	61	65	66
Activity in a market niche [%]	39	42	36	30
Activity in a wide arena of competition [%]	61	58	64	70
Business performance	61	60	63	66
Quantitative business performance	49	47	52	58
Qualitative business performance	68	68	70	71

Tab. 5. Comparison of development determinants and processes of the companies surveyed from the point of view of dynamics and statistics of the life cycle stages

Variable	Levene's test		t-test for equality of means				
	Equal variances	F	t	df	Mean for stages:		Mean difference
					static	dynamic	
Owner's entrepreneurship	not assumed	13.47**	-9.50**	1737	66.52	77.06	-10.54
Organisational flexibility	assumed	3.15	-12.58**	1739	45.18	60.32	-15.14
Involvement in innovative activities	assumed	0.11	-14.16**	1739	47.83	63.49	-15.66
Intensity of competition in the industry	assumed	2.23	2.52*	1739	75.11	72.18	2.92
Prospects of industry development	not assumed	7.07**	-12.03**	1737	55.82	69.59	-13.77
Competition arena	not assumed	29.15**	2.86**	1700	1.64	1.57	0.07
Business performance	assumed	0.05	-10.81**	1739	57.70	65.53	-7.82
Quantitative business performance	assumed	0.15	-10.47**	1739	45.06	54.28	-9.23
Qualitative business performance	assumed	0.39	-8.33**	1739	65.19	72.17	-6.98

* significant at 0.05; ** significant at 0.01. Student's t-test for equality of means; Levene's test.

The results of the comparison indicate that companies in the static and dynamic stages of the life cycle differ significantly in terms of assessment of the analysed determinants and effects of small business development processes. Companies operating in the dynamic life-cycle stages are run by more enterprising owners who are actively focused on the identification of market opportunities through cooperation and building positive relations with the environment. These entrepreneurs can and like taking business risk, using appropriate calculation and optimisation of its level. They are also characterised by positive self-assessment and higher effectiveness of operation than business owners of companies in the static stages of the life cycle.

Higher levels of flexibility and involvement in innovative activities are also important features of enterprises operating in the dynamic stages of the life cycle. Flexibility as one of the basic determinants of small business competitiveness requires an increased level of resources allowing their dynamic allocation for development activities. This confirms, therefore, the existence of higher levels of SME resources in the dynamic stages compared to the static ones. Anticipating market trends and exploiting market opportunities, which promotes greater involvement in innovative activities in the dynamic stages of the life cycle, are also important components of flexibility.

The phenomenon of more positive perception and better use of the potential of the business environment also occurs in the dynamic stages. Companies operating in such stages often build their market position in market niches, adopting a strategy of diversification. Due to this fact, they assess the level of competition as lower and assess prospects for the industry in which they operate more positively. The results obtained therefore fully confirm the hypothesis H1 according to which SMEs operating in the dynamic stages of the S&D life cycle model are characterised by higher levels of the potential of internal development factors and perceive the potential of the business environment more positively than SMEs operating in the static stages.

The recognised internal determinants and the positive perception of the business environment translate into the higher business performance of SMEs operating in the dynamic stages of the life cycle. Although the companies surveyed generally assess their qualitative results better than quantitative ones, the companies operating in the dynamic stages of the life cycle achieve relatively higher growth of quantitative results than qualitative ones. This confirms, therefore, also relatively higher levels of resources of these entities, resulting in the ability to initiate and pursue innovative and market activities to a much greater extent than in the case of companies operating in the static stages of the life cycle. These

results, therefore, fully confirm the hypothesis H2, which assumes that SMEs operating in the dynamic stages of the S&D life cycle model achieve higher business performance than SMEs operating in the static stages.

4. Limitations and further directions in the use of the S&D life cycle model

When considering the results obtained and formulating cognitive conclusions and applications, limitations of the research should be considered (Geletkanycz & Tepper, 2012). First, these include methodological limitations associated with the use of cross-sectional studies (Sreejesh, Mohapatra & Anusree, 2014) which do not allow to capture dynamic changes taking place in companies over time. This makes the identification and description of the transformation taking place in the life cycle of the surveyed SMEs difficult. Conducting retrospective longitudinal studies (Rose, Spinks & Canhoto, 2015) could be an answer to the identified limitations, allowing more precise identification and assessment of determinants and effects of SME development in the individual stages of the life cycle.

Another limitation is high subjectivity of evaluations and opinions provided by the respondents resulting from the use of survey research method (Beam, 2012). The method makes it difficult to obtain proper responses, accurately reflecting the organisational reality in the companies surveyed. The high level of complexity and multidimensionality of the constructs analysed should also be considered. Due to the methodological limitations, their operationalisation included only selected indicators and was simplified.

Considering the results obtained, the research should be continued. Interesting directions of further empirical analysis can include the identification and assessment of the evolutionary nature of the proposed S&D life cycle model. In this area, it is worth focusing on key factors determining the transition from one stage of the life cycle to the next, with particular regard to the transition between the static and dynamic stages of the life cycle. In the area of methodology, one should consider the preparation of a measuring scale allowing more precise and objective selection of the stage of the life cycle best suited to the organisational situation of the company concerned.

Conclusions

The paper proposes an original, 8-stage statics and dynamics model in the small business life cycle (S&D life cycle model). It constitutes a novel approach, based on the current theoretical achievements, to determination and classification of the life cycle stages based on the dynamics of development processes, market activity, or the investment scope. In this model, the static stages, in which development efforts focus on current activities and ensuring the continuity of the survival of a given company, form the first group. These include the following stages: the pre-emergence, survival, stabilisation and decline ones. Their antitheses are the dynamic stages characterised by an active or even proactive approach to development, investment and market processes. These include the following stages: emergence, dynamic growth, separation and expansion as well as revitalisation. The proposed model reduces the disadvantages of the existing theoretical approaches through the rejection of the deterministic nature of the described development paths. At the same time, it allows the identification and understanding of internal and external determinants and effects of small business development activity.

The results of the empirical research conducted on a sample of 1,741 micro, small and medium-sized enterprises from 22 countries of the European Union provide the confirmation. They indicate the existence of significant differences between companies operating in the static and dynamic stages of the life cycle in the following three main areas:

- in the area of internal development determinants, companies operating in the dynamic life-cycle stages are run by more enterprising owners, show a higher level of organisational flexibility and greater involvement in innovative activities;
- in the area of external development determinants, companies operating in the dynamic stages of the life cycle more often exploit the potential resulting from activities in market niches, thus limiting the intensity of competition in the industry. Entrepreneurs from such companies also more positively assess the potential of the business environment related to the better assessment of industry development prospects;

- in the area of effects of development processes, companies operating in the dynamic stages of the life cycle achieve better business performance in terms of qualitative as well as quantitative results.

The presented theoretical approach and the obtained empirical research results provide new conclusions in the discussion on the cognitive value of the small business life cycle model (Tendai, 2013; Tam & Gray, 2016). Based on these considerations, it can be concluded that the S&D life cycle model allows to describe the potential of internal development determinants and the manner of perception of the potential of the small business environment. At the same time, it also provides subsequent evidence explaining the volatility of business performance of micro, small and medium-sized enterprises.

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Enhancing the tourist attraction visiting process with gamification: key concepts

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ABSTRACT
The main purpose of this paper is to describe key gamification techniques that can be applied to enhance the tourist attraction visiting process. The paper is based on the methodology of design patterns; particularly it adopts the definition and classification schemes originally proposed and developed in the context of gamification of work to specify gamification techniques related to various aspects of the tourist attraction visiting process. The main result is the selection of twelve gamification techniques for enhancing the tourist attraction visiting process, four for each of the three phases of the visiting process (before, during and after the visit). The paper shows that gamification techniques can be applied to enhance the tourist attraction visiting process. Implementation of the proposed gamification techniques is supposed to both improve visitor experience and give the tourist attraction managers a tool for boosting interest in less popular exhibitions and events.

KEY WORDS
tourism gamification, visitors' experience, tourist attraction management

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Introduction

While the tourist attraction management must consider various aspects of the attraction's operation such as administration, maintenance and development, education and communication, or marketing and public relations, the visiting process should always be its primary concern as it shapes the tourist experience. When executed correctly, it leaves a good impression even from a visit to a dull site; if faulty, it can turn a visit to a world-class attraction into a negative experience.

In this paper, the possibility of enhancing the visiting process with gamification techniques is considered. The objectives of the paper are to identify and classify problematic situations, to define remedies

to counter them, and to assign appropriate gamification techniques that support these remedies.

The paper starts, however, with an explanation of basics of gamification based on the literature. The chosen design approach is presented in section 2, whereas sections 3-5 form the core of the paper, as they describe the gamification techniques applicable respectively to the three phases of the visiting process. The final section presents conclusions.

1. Literature review

Gamification describes the idea of using particular elements of games in contexts outside that field to make them more interesting or to raise the customer's motivation (Deterding et al., 2011, pp. 9-10). The term "gamification" was initially coined in 2002 (Pelling, 2011) and has gradually been adopted in research and practice since 2010 (Deterding et al., 2011, p. 9). That year, at the TED Innovations Conference in Monterey, game designer Jane McGonigal gave a pioneering lecture in which she clarified "that gamers are a human resource that we can use to do real-world work, that games are a powerful platform for change. We have all these amazing superpowers: blissful productivity, the ability to weave a tight social fabric, this feeling of urgent optimism and the desire for epic meaning" (McGonigal, 2010, pp. 18-51).

Since 2010, hype about the topic of gamification has emerged, fuelled by marketing experts who saw great opportunities regarding more efficient relations with the customers. Consequently, numerous gamified systems were developed and implemented in various areas (for example education, trading, tourism, and health).

There were some factors behind the success and the increasing adoption of gamification. Video games and the use of playful elements (online as well as offline) became increasingly accepted culturally. Furthermore, the acceptance of customers towards dealing with gamified systems increased as well (Shauchenka, Ternès & Towers, 2014, p. 33). The most important factor, however, was the technological progress and falling manufacturing costs for technological products (such as smartphones) which it caused. As a result, technologically-mediated gamification could be made accessible to a larger target group (Sailer, 2016, pp. 5-6).

Gamification is a relatively new term for an old phenomenon. The basic idea of using playful elements outside the field of games is neither new nor limited to modern media. For instance, the military has been using games and simulations in drills for centuries. The same is true for badges to distinguish different ranks (Zichermann & Cunningham, 2011, p. 9). A similar ranking system has been used by the scout-movement since 1910. Members receive badges for new experiences, learned skills or performed services. The worldwide fast food franchise McDonald's had used game mechanics for its business long before the term gamification was coined: the popular McDonald's monopoly board was created already in 1987 (Amadou, 2011).

1.1. Definitions

Currently, there are many definitions of the term gamification used in the literature. Three most popular will be introduced briefly. Zichermann and Cunningham (2011) define the term gamification as "the process of game-thinking and game mechanics to engage users and solve problems" (pp. 14-15). Thus, gamification makes use of game mechanics to motivate consumers more, to solve certain problems and to design the necessary tasks in a more interesting way (Zichermann & Cunningham, 2011, pp. 14-16). According to Kapp, Blair and Mesch (2014) gamification consists of three components: "Gamification is using game-based mechanics, aesthetics, and game-thinking to engage people, motivate action, promote learning, and solve problems" (p. 86). The "game-thinking" expression follows from the idea that every daily action also offers some playful potential, through which it can be made more interesting. However, there are critical views on these definitions since both limit the reach of gamification by naming precise goals (Sailer, 2016, p. 8). For this reason, a relatively simple and merely limiting definition was established in a scientific discourse (Ruffino, 2014, p. 50). It can be traced back to Deterding et al. (2011), who describe gamification as "the use of game design elements in non-game contexts" (p. 10). This definition consists of four elements that are explained briefly below.

Game. To begin with, the terms "game" and "play" are to be distinguished from one another in the context of gamification. For this purpose, a model by Roger Caillois (1961) can be used (Salen & Zimmermann, 2004, pp. 308-309). He assigned several playful activities to either the concept of ludus or to the concept of *paidia*. The term paidia in this respect describes an unregulated and spontaneous

joy about an activity. The counterpart to this is described through the term *ludus*, which describes a disciplined and strongly regulated playful activity (Caillois, 1961, p. 26). In the context of gamification, *ludus* denotes the concept of games, in which certain rules and clearly defined goals are in the foreground. Consequently, they do not solely serve the purpose of entertainment, but they do have an additional and higher meaning. *Paidia* can be understood in the sense of play and describes a free, improvised behaviour without a particular structure, serving only the purpose of entertainment. As the name gamification suggests, gamified solutions are to be assigned mainly to the *ludus* side. This, however, does not exclude the *paidia* side (Sailer, 2016, pp. 9-12).

Elements. To specify the characteristics of a game element, the concepts of gamification and serious games can be opposed to one another. Serious games can also be assigned to the *ludus* side. Following this concept, the consumer is meant to reach a higher goal through a playful process (for example learning). What the concepts of gamification and serious games have in common is that they aim at non-entertainment goals by means of a controlled process (Sailer, 2016, pp. 12-13). The difference, however, is that serious games are understood as fully-fledged games, while the concept of gamification only refers to the use of typical elements of games. Yet, the line between game elements and the fully-fledged game is sometimes quite blurry and often influenced by individual views.

Non-game context. The definition of gamification excludes the gamification of games. This process would not be a gamification, but merely an extension of the game content and, therefore, a part of game design (Shauchenka et al., 2014, p. 35). In this respect, it does not matter whether a classic board game, a card game or a video game is affected. Thus, it is not the content that is of relevance, but the context (Rackwitz, 2015, p. 219).

Gamification aims at enhancing miscellaneous non-game contexts by means of game design elements (Deterding et al., 2011, pp. 12-13). Normally, these elements serve the purpose of entertaining the player. In the concept of gamification, however, game design elements are mainly used to reach different goals, for example to amplify motivation, engagement and participation of the consumer or to support learning and interaction (Sailer, 2016, p. 14).

Design. The term *design* in the context of gamification can theoretically refer to game elements (typical and characteristic components of games) or game-based technologies (for example game controllers, 3D graphics engines, authoring tools). Deterding et al. (2011) suggest using the term gamification exclusively relating to typical game design, and to illustrate this, consequently use the term *game design element* (instead of *gamification design element*). Yet, compared to fully-fledged games, only several game design elements are purposefully used in a gamified application.

Deterding et al. (2011) managed to identify these game design elements on five different levels of abstraction, which are subsequently displayed and described in Tab. 1. To provide a more intelligible description of the individual levels of abstraction, descriptions by Morschheuser (2013) were used as well.

Tab. 1. Abstraction levels of game design elements

Level of abstraction	Description
Game interface design patterns	Interface-elements are located on the level best visible to the user. Those are known from video games. Some of them are for example progress bars, points, badges, leaderboards, ranks or levels
Game design patterns and mechanics	The second level determines the functionality of the interface elements (for example time constraint, limited resources) and thus influences the way in which the game is experienced (for example fun or experiences)
Game design principles and heuristics	They prescribe the framework or the core for the implementation of gamification. In this respect, psychological aspects are considered (for example clear goals or a variety of game styles). The principles of game design are crucial to the generation of motivation
Game models	On this level, the correct usage of interface elements and game design mechanisms are justified. These models are described as "conceptual models of the components of games or game experience" (Deterding et al., 2011, p. 12)
Game design methods	Processes and methods of game development (for example playtesting or play-centric design) help game designers at implementing the gamification

Source: authors' elaboration on the basis of (Deterding et al., 2011, p. 12; Morschheuser, 2013).

For the user, the effect of game design elements is limited to the first two levels only (interface elements, game mechanics). For gamification designers, on the other hand, the methods and the game model are of initial interest, followed by game design principles, which constitute the core of a successful game design, and then by the mechanics and interface elements. The gamification designers are therefore meant to read the table from bottom to top (Morschheuser, 2013).

1.2. Player motivation and classification

To develop an effective gamification strategy, understanding what motivates people is essential. Generally speaking, intrinsic motivation is distinguished from extrinsic motivation. Intrinsic motivation describes the own and inner drive of an individual. In contrast, extrinsic motivation describes external stimuli like money, trophies, social recognition or commendation (Matallaoui et al., 2017, p. 12).

In the development of gamified systems, intrinsic motivation (for example achievement or status) as well as extrinsic motivation (for example rank, points, leaderboards and badges) should be addressed (Kapp et al., 2014, p. 239). In this way, a player receives important and positive feedback for his/her activities, which may motivate him/her to learn or study (Fernandes, 2016). That feedback is crucial for motivation, and the emergence of an ideal condition referred to as flow (Sailer, 2016, p. 31).

The flow theory can be traced back to psychologist Mihaly Csikszentmihalyi (1975) and describes the ideal state between the anxiety of being overcharged and boredom as a result of not being challenged enough. In this condition, players are so immersed in an activity that nothing else is of importance to them (Csikszentmihalyi, 1975, pp. 49-54). Csikszentmihalyi furthermore differentiates several characteristics of the flow. In particular, game designers have to take account of characteristics which are responsible for motivation and engagement. These are the design of challenging tasks, the definition of clear goals and giving feedback to the player (Matallaoui et al., 2017, pp. 14-15). To find the ideal point, game designers have to create an elaborate interaction between the system and the player, and monitor this interaction via constant feedback loops (Zichermann & Cunningham, 2011, p. 17). In that respect, it must be considered that there are different archetypes of players which can be addressed through individual forms of motivation (Matallaoui et al., 2017, p. 2).

One of the most established theories for classification of player types goes back to Richard Bartle. He studied the behaviour of video game players and was able to group them into four categories:

- *killers* who value competition against other players, victory is their goal,
- *achievers* who like clear rules and goals, want to collect points and level up, want to be the best or the first,
- *socialisers* who use games to connect socially or to interact, the community is their goal,
- *explorers* who want to explore the rules, ideal strategies, mechanisms and secrets of the game (Bartle, 2003, pp. 162-166).

However, no player can exclusively be put into one category. In fact, shares of all four categories can be found in every player. For implementing a successful gamification, the application should consider and serve all four categories, if that is possible (Zichermann & Cunningham, 2011, pp. 21-24).

1.3. Application of gamification in tourism

The idea of applying gamification in tourism has found acceptance in both literature and practice. One of the earlier works on the topic, by Nicholson (2012), is focused on science and other participatory museums which, according to him, "provide models for both real-world and digital gamification environments". It promotes the concept of "meaningful gamification" which enables participants to "find meaning in a real-world activity, which can then lead to building up internal motivation to engage with that activity".

Xu et al. (2017) identify six areas in which, according to them, gamification can benefit tourism, which include "raise brand awareness", "enhance tourist experiences", "engagement", "improve customer loyalty", "entertainment" and "employee management", and provide several examples illustrating such applications (though some of them seem related rather to games than gamification).

A more comprehensive overview of tourism gamification is provided by Negruşa et al. (2015) who investigate it in the context of sustainability, noting the links between these two concepts. They distinguish three types of sustainable gamification effects (economic, social and environmental) and provide

their real-world-based examples for three types of relationships: tourism organisation – tourist (exemplary objective: higher consumption frequency), tourism organisation – employee (exemplary objective: increase productivity levels) and tourism organisation – community (exemplary objective: save energy and reduce waste).

While the two sources mentioned above report on and classify the various examples of the application of gamification to tourism, there is also literature on how to apply gamification to tourism. The most important work in this vein is by Bulencer and Egger (2015) who provide the Memorable Experience Design framework combining design process and properties with theories, tools and techniques related to gamification and experience design.

Apart from the pragmatic view of tourism gamification, some implications of more theoretical nature were drawn in the literature. One notable example is the paper by Loong (2014) which proposes and interrogates the ontological assumption that tourism is being gamified, considers the blurring of boundaries between representation and reality, and its significance in tourism, as well as outlines an adequate methodological framework.

2. Research methods

The chosen approach adopts the concepts originally defined and developed in the context of design patterns for gamification of work (Swacha & Muszyńska, 2016). While the techniques described in the following section neither adopt nor implement the work gamification design patterns, both the name/context/problem/solution scheme for their definition and what/when-where/how/why scheme for their classification are followed. Therefore, each technique is classified into one of the following four types:

- affecting *what* a tourist does,
- affecting *when* or *where* a tourist does what he/she does,
- affecting *how* a tourist does what he/she does,
- affecting *why* a tourist does what he/she does,

and described using the following four fields:

- the *name*, assigned to techniques with care to make them descriptive,
- the *context* for its usage, describing a situation which deserves attention and possible application of certain gamification technique,
- the *problem*, which is the actual goal that is to be achieved by applying gamification – the apparent shift of terms is intentional, as what is a solution to a tourist-related issue (forming the context) becomes itself a problem for the gamification designer,
- the *solution*, which describes how the problem can be solved using game-inspired techniques.

Regarding the tourist attraction visiting process, it is considered in its wide definition as consisting of the three phases identified by Staab et al. (2012) in the context of tourism consumer life cycle, that is: before trip, on site and after trip. For this reason, the following three sections describe gamification techniques suitable for the respective phases of the visiting process.

3. Techniques applicable before a trip

The first phase of the tourist attraction visiting process, the core element of which is a trip planning, is of key importance from the point of view of a tourism attraction manager, as it is decided in this phase whether a tourist will actually make a visit, where he/she will do so and when.

The gamification can be used to attract a tourist by increasing his or her interest in visiting by posing a challenge and promising a reward. Tab. 2 lists four types of challenges specific for the before-trip phase. Notice that all the proposed solutions there require the gamification system to be accessible before the visit.

4. Techniques applicable on site

It is during the second phase of the tourist attraction visiting process that the core visitor experience is formed. A positive visitor experience is a result of several factors, and a tourist attraction manager can have an impact on only a part of them. Gamification can raise the level of visitor satisfaction by instilling him or her with three types of effects (Herger, 2014):

- aah-effect – a feeling of surprise mingled with admiration that could be caused by something

Tab. 2. Techniques applicable in the before-trip phase of the visiting process

Name (*Type*)	Context	Problem	Solution
Challenge of visit (*what*)	few tourists visit a tourism attraction	attract visitors	reward coming with points, badges and/or collectibles
Challenge of place and time (*when-where*)	• an event is planned with little interest from tourists, • the attraction is overcrowded in rush hours and lacks visitors in the morning and/or evening hours	attract visitors to a given place and time	reward attending an event (or, more generally an attraction at a certain time) with bonus points, badges and/or collectibles
Challenge of public transit (*how*)	most tourists come by car	parking is overcrowded	reward coming by public transit with bonus points, badges and/or collectibles
Challenge of exhibit (*why*)	• tourists see little reason to visit an attraction, • tourists do not recognise the value of an exhibit	make visitors interested in a particular exhibit	make seeing an exhibit a part of a longer quest completing which is rewarded with points, badges and/or collectibles

Tab. 3. Techniques applicable in the on-site phase of the visiting process

Name (*Type*)	Context	Problem	Solution
Story (*what*)	some tourists may not see the general idea behind the exhibits or may not link various exhibits with each other	make visitors aware of the root idea and let them immerse in the world of exhibition	present a story providing a historical background, putting exhibits in proper context and linking them into a consistent whole; the story should be presented by a host, a fictional or historical figure related to the site or exhibition
Completion (*when-where*)	• the visitors only visit part of the attraction, • some exhibitions are overcrowded and others lack visitors	direct visitors to less attractive exhibitions	define sets of exhibits (mixing popular and unpopular ones), reward seeing all of the exhibits in a set on the same day with bonus points, badges and/or collectibles
Puzzles (*how*)	the visitors quickly pass by exhibits, ignoring their interesting properties or history	make visitors get the maximum impression and information about exhibits	present visitors with trivia, riddles or puzzles whose solving requires close examination of an exhibit or a moment of thought about it
Collector (*why*)	some tourists may find the tourism attraction boring	involve visitors in a game, making them interested during their full visit time	the universal collector game scheme is to find items hidden in exhibits; the goal of such game could be to find a treasure, rescue a princess or solve a mystery

beautiful, unexpected, unfamiliar, or inexplicable,
- aha-effect – typically felt when solving a puzzle or finally understanding a complex process or system,
- haha-effect – a spontaneous expression of amusement.

Tab. 3 lists four gamification techniques specific to the on-site phase.

5. Techniques applicable after a trip

The third and last phase of the tourist attraction visiting process impacts how tourists would remember their visits and whether or how often they would make another visit. The gamification can be used both to reinforce memories of previous visits and to provide reasons for next visits. Tab. 4 lists four gamification techniques specific for the after-trip phase.

Tab. 4. Techniques applicable in the after-trip phase of the visiting process

Name (Type)	Context	Problem	Solution
Quest (*what*)	some tourists may not see a reason to visit attractions similar to the ones they already visited	make visitors interested in visiting attractions similar to the ones they already visited	• provide a story-based quest giving reasons to see other similar attractions (for example, visit all castles in an area), • reward completing a quest with points, badges and/or collectibles
Achievements (*when-where*)	• visitors do not come at early or late hours, • visitors do not come to some attractions	give visitors reasons to come at unpopular hours or to unpopular places	• define achievements such as visiting early or coming to less-known attractions, • reward achievements with points, badges and/or collectibles
Streaks (*how*)	tourists make only irregular visits	instil a habit of periodic visits among visitors	• count weeks or months with at least one visit (a streak), • reward long streaks with points, badges and/or collectibles
Progress (*why*)	• tourists do not see their visits as a continued experience, • tourists forget about their past visits	make visitors feel that every visit counts	• define visitor level increasing with points, • provide visitors with information on where they have been to, what level they are on, how many points they have or what badges they have collected so far, • provide visitors with progress bars showing how far they are from levelling up or getting a badge, • present leaderboards showing who is doing best (highest level, most points, most badges), • give discounts or souvenirs for the leaders

Notice that all the proposed solutions there require the gamification system to be accessible after the visit.

Conclusions

Gamification has already made its entrance into tourism. It has already been applied to improve three types of relationships: between tourism organisation and tourist, between tourism organisation and employee, and between tourism organisation and community.

This paper addresses the first of the mentioned, presenting a selection of gamification techniques for enhancing the tourist attraction visiting process. For each of the three phases of the visiting process (before trip, on site and after trip), four types of problems were addressed, corresponding respectively to an intended change in:

- when and where they go,
- how they make their visits,
- and what motivates them to make a visit and see the exhibits.

An interesting and weighty observation coming from Tab. 2 and 4 is that all the solutions proposed there require the gamification to both precede and last beyond the time spent on the visited site. It can be easily achieved only if the gamification system encompasses more than one tourist attraction.

The scope of the paper is limited to the choice of techniques adequate to the identified situations that can happen during the visiting process. While the effectiveness of the proposed techniques can only be backed now with the successful application of similar techniques in other areas of life and economy (Chou, 2015), it is an interesting scientific problem for future work to verify their effectiveness based on data from real-world implementations. A good opportunity for such work emerges from completing the BalticMuseums: Love IT! Project on which both authors collaborate (BalticMuseums, 2017).

Another vein of future research based on real-world-based implementation should be to extend both the list of the proposed techniques (with new ones, possibly addressing other kinds of problems) and the description of each of the proposed techniques (with implementation guidelines, application examples and notes on observed consequences).

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