

Developing a Design Management Model for Innovating SMEs in the Context of Regional Smart Specialisation

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Abstract

The research paper presents the development of a design management model for SMEs based on the implementation of a design intervention programme. Using two regional SME cases and applying a process-based design intervention, the challenges of the SMEs are addressed and reduced in a more efficient and effective way. Therefore, new strategic perspectives for organisational change, innovation and competitive strength can be recognised. The integration and comparison of two SMEs facilitates the inductive implications for the delineation of a design management model and reduces the potential for controversy. The proposed model implies both theoretical and practical contributions: contributing to design management literature on SMEs and suggesting a practice-based process model for SMEs in improving their performance. This model expands the potential of design integration in SMEs and may motivate SMEs to participate in design support programmes to improve performance. Sustainable aspects of the model are subject to future research.

JEL classification codes: O14

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1. Introduction

Design and design management, its effectiveness and efficiency, as a tool, process, style or way of thinking and acting had already been acknowledged for organisational change and strategic strength by scholars from different disciplines. Yet, design management integration within practice-oriented SMEs has been largely marginalised or not successfully accomplished compared to other types of organisations or business settings (Cawood, 1997; Bruce et al., 1999; Moultrie et al., 2007; Ward et al., 2009; Yström & Karlsson, 2010; Matthews & Bucolo, 2011; Bucolo & Matthews, 2011; Fernandez-Mesa et al., 2013, Barison, 2015). It is a paradox of missing competencies and a lack of practice-oriented processual models of dealing with design in small businesses (Bruce et al., 1999; Dickson et al., 1995; Walsh, 1985). The applicable research remains scattered in the case of using design management for SMEs.

Nevertheless, an increasing interest in design integration in government policies and business support programmes has recently been observed, which target the SME sector (Raulik et al., 2008; Moultrie & Livesey, 2009; World Design Survey Report 2010 SEOUL; Immonen, 2013; Global Design Watch 2010, etc.). Yet, most design-designated initiatives are concentrated in certain already creativity-driven geographic regions (e.g. New Zealand (Better by Design), United Kingdom (Design for Demand), Australia (Ulysses), and Denmark (Danish Design Ladder) (Bucolo & Matthews, 2011, p. 3; Straker & Wrigley, 2014, p. 2). In particular, these are usually regions of strong economic performance. Despite an increase in initiatives that support the role of design for innovation and the positive economic effects on business, most of these imply design monitoring or design auditing. Yet, a much greater need in solving specific enterprise-related barriers in design utilisation is seen, such as decreasing the gap in knowledge and research – by means of policy support and design intervention programmes – on what processes and frameworks may be adopted by enterprises to assist them in becoming design-oriented (Bucolo & Matthews, 2011, pp. 4–5; Ward et al., 2009, p. 78).

No single entrepreneurship innovation intervention from participation in design support programmes could be organisational change. Most research has marginalised the issue of change at the organisational level induced by design intervention programmes. This bears a clear research gap. Although design intervention programmes for SMEs show significant economic growth in enterprises, little is known about how SMEs can develop capabilities in a sustainable way to become more design-led in developing innovations, and more competitive, even when using external support via such programmes. Crucial issues remain the process of how to employ tools, what challenges and opportunities are related to the design integration process and how the management of design integration takes place (Bucolo & Matthews, 2011, p. 5; Yström & Karlsson, 2010, p. 3). The literature clearly supports the idea that knowledge on organisational change occurring as a result of opportunity recognition, innovation, organisational strategy and organisational culture is to a large extent missing (Matthews & Bucolo, 2011, p. 999). An integrated approach to innovation involving design and technology is considered a key driving factor for economic growth and competitive advantage (Lüttgens & Piller, 2010; Wood et al., 2011). Yet, the expansion of design beyond the tactical entrepreneurial activities of SMEs at the regional level is not fully utilised. This is especially true in the face of pressure on enterprises that are forced to adapt to new circumstances of competition, social expectation and cultural understanding (Buchanan, 2015, p. 5; Deserti & Rizzo, 2014, p. 36; Lockwood, 2004, p. 37; European Commission 2014a, 2014b, 2015; Delgado et. al, 2012, Porter, 2000; Edinburgh Group, 2012; Ayyagari et. al, 2011; Fraser, 2010, etc.).

The challenging nature of this research field was at the heart of a cross-border research project aiming to improve innovation and competitiveness in regional SMEs from the South Baltic Sea Region. In this region, SMEs are recognised as being less competitive and performing worse than their counterparts. Within the framework of the South Baltic Programme 2007–2013 and the INTERREG IVA cross-border project Design EntrepreneurSHIP, including four partners from Poland, Germany and Sweden, the author acting as one of the project partners representing the research field addressed the research problem of the rather marginalised focus on innovation development in SMEs by integrating design management in operational and strategic arrays. The research target group included manufacturing (technology-driven) and non-creativity-driven, micro and small regional enterprises that needed support according to performance figures in regard to regional development and smart specialisation strategies. These SMEs have rather limited design competencies and capabilities.

Using design management practices implemented within the project, the researcher aims to develop a multidisciplinary design management process model for SMEs, which could serve our regional businesses as an integrating and orientation tool for deployment in entrepreneurial practices in technology-driven micro and small enterprises, which suffer from less design orientation. Therefore, the following research question is raised by the author: *How can a practice-oriented multidisciplinary design management process model be constructed for technology-driven micro and small enterprises leading towards increased design orientation and innovation as a result of a design intervention programme?*

In order to provide an answer to the research question, first, the researcher constructed a conceptual framework based on innovation, and strategic and organisational management literature. Then, this is used for a design management implementation scheme with regional SMEs. The author limits the research scope to two enterprises and design management implementation with them. Therefore, two regional SMEs are treated as separate enterprise case studies with 10 SME solution cases solved. Based on the given problem and objective related to each individual enterprise and its ecosystem, SME-tailored solutions are proposed facilitating innovation, competitiveness and growth potential. On this basis, the author proposes a practice-oriented design management model, and discusses implications for technology-driven SMEs related to innovation, increased competitiveness and growth.

2. Theoretical framework

2.1. Ecosystem perspective – design and management for innovation

Innovation is recognised as a key factor for increasing productivity, efficiency, competitiveness, business growth, employment and to achieve socio-environmental compliance within an entire ecosystem (Fagenberg and Nelson, 2005; Tejinder, 2010). By eliminating or reducing the negative external impact from the environment (i.e. the market) and improving internal operational and strategic interactions, enterprises enhance their capabilities in overcoming environmental challenges or reducing their negative impact (Damanpour et al., 2009; Damanpour & Aravind, 2012). Building upon the past and recent trends and the multifunctional deployment of design management within enterprises, design management has been perceived as both a very narrow and specific or very comprehensive phenomenon. Broadly, design management can be understood as all the methods, means and tools referring to planning,

realisation and controlling the effective use of design to achieve business objectives. Design management is perceived as a holistic process extending across all design fields aimed to create a homogeneous image of an enterprise (Meier-Kortwig, 1997, pp. 17-19). Definitions of design management in a similar fashion are found in numerous other writings, where it is conceived as a bundle of organisational and managerial skills and practices to optimise the design process (Chiva & Alegre, 2009, p. 426; Koostra et al., 2009, p. 9). Most research shares the objective of scrutinising the impact of design management on enterprises and their markets, products and consumer orientation alongside their performance on the market of their marketing strategy (Nevado et al., 2016, p. 74). Debates related to implications on internal operational and small business processes appear to have been marginalised in topical discourses (Borja de Mozota, 2003, p. 88). Nevertheless, design has been a research focus from the organisational perspective. It is recognised as a resource deployed by the management or an activity involving numerous interactions with other actors in the product, service or process development process (Walsh, 2000, p. 74). Yet, it might be argued here that design management, when applied within the entrepreneurial dimension, should cover three different levels of enterprise management – the strategic, tactical and operational level (Holland & Lam, 2014, p. 22).

In fact, it is essential to link all actors in the innovation process, both inside and outside the firm, to establish and maintain the role of designer as a “gatekeeper” that facilitates such linkages (Walsh, 2000, p. 88). Similarly, Gardien and Gilsing (2013) recall the need to integrate internal and external perspectives for innovation generation. This means it is necessary to create meaning beyond the technological improvement of a product. It is much more about creating an ecosystem and integrating different perspectives that enable a transformation and therefore innovation (p. 56). By acknowledging design’s value for organisations, its power to differentiate, position on the market and improve the functionality of internal processes and the external appearance of organisations (products, services), it can be viewed as a strategic resource. Indeed, design management is understood as a development process leading towards the optimisation of organisational performance, which can be expressed in the form of products, services, organisational processes or positioning (brand) – ‘the 4Ps of the innovation space’ (Tidd & Bessant, 2013, pp. 24–29).

2.2. Design as a strategic partner within entrepreneurial discovery

Since innovation is regarded as key to competitiveness and growth, and design as a strategic resource, then the creativity and design that integrates entrepreneurial performance becomes the concern of the strategic domain. Indeed, the success of the strategic domain can be associated with key factors that define the enterprise’s performance internally and externally on the market; in other words, resources, capabilities, competencies and used opportunities (Wernerfelt, 1984; Barney, 1991, 2001; Amit & Shoemaker, 1993; Peteraf, 1993; Prahalad & Hamel, 1990; Alvarez & Busenitz, 2001; Connor, 2002; Hoopes et al., 2003; Helfat & Peteraf, 2003; Casson & Wadeson, 2007; Teece, 2007; Crook et al., 2008; Naranjo-Valencia et al., 2011; Foss, 2011; Candi, 2016). It can be argued therefore that there is a clear conceptual linkage of design and management perspectives with regard to the domain of strategy. This is also supported by the longitudinal research outputs (Mintzberg, 1990; Liedtka, 2004; Liedtka & Mintzberg, 2007; Beverland & Farrelly, 2007; Brown, 2008; Martin, 2009; Malins & Gulari, 2016; Gulari & Fremantle, 2015). Design is a value creator and strategic tool to be deployed within entrepreneurial practices that strengthens the strategic performance of an enterprise

(Kotler & Rath, 1984; p. 16; Er, 1997, p. 293; Borja de Mozota, 1998, p. 26; Verganti, 2008, p. 440; Borja de Mozota & Kim, 2009, p. 67).

As a result, two key research streams related to design have viewed design through the strategic lens of strategic design and service design. The research on strategic design started around the 1980s and argued for the role of design in managing design projects as a reaction to the growing complexity of new product development processes (Holland & Lam, 2014, p. 5). Design is also a reaction to alter the resource domain or to improve corporate performance; therefore, leading towards a corporate transformation that affects strategy, structure, systems and the culture of enterprise (Ravasi & Lojacono, 2005, p. 52; Candi, 2016, p. 34). Indeed, design is being increasingly acknowledged as a strategic resource (Borja de Mozota, 2006, p. 46; Stevens 2010, p. 1; Westcott et al., 2013, p. 15; Hertenstein et al., 2013, p. 8; Holland & Lam, 2014, p. 154). With regard to service design, the strategic role of design has also been frequently revealed through the lens of 'customer value' (Schmiedgen, 2011, p. 1). Design innovation and therefore business modelling has been linked through service design approaches (mostly, design thinking). Nevertheless, the role of other driving parameters and factors for business model and strategy from the design management related literature seem to be underestimated (Borja de Mozota, 2013). It is not necessarily the design thinking approach that can be used as the best approach for innovation and business modelling purposes in enterprises, or value creation from the business model, as the literature showcases.

Having recognised the importance of resources, capabilities, capacities, competencies and opportunities for the strategic orientation of enterprises, advocates of design and creativity also started to integrate the strategic notion within design-related discourses. Building upon the Resource-Based View (RBV), design might be perceived as a resource, core competency, capability, capital, differentiator, integrator, transformer and good business practice (Borja de Mozota, 2006, p. 45). This is because RBV recognises organisational development and its strategic performance emerging from efficiently and effectively bundled and deployed resources, capabilities and knowledge internally (organisational level). Based on scholars that focus on resource impact (Helfat & Peteraf, 2003, p. 999; Bertola & Teixeira, 2002, p. 181), it might be argued that design could act as a resource, organisational competency and capability. In addition, it can be used as an intangible asset (e.g. creative capabilities and knowledge) or a tangible input (expressed through visualisation, form, performance and ergonomics) to production that an organisation owns, controls or has access to. With such a bundle of organisational strengths, an enterprise is able to generate a competitive advantage (Wernerfelt, 1984; Grant, 1991; Rasche, 1994) or sustainable competitive advantage. Resources (here also design) encapsulate sustainability peculiarities, since they are likely to be hardly duplicable, imperfectly imitable and non-substitutable (Barney, 1991, pp. 105-106; Boxall, 1996, p. 65). This can be done in the case of design through, for example, distinctive form, style, messages combined with performance and functionality that design possesses, or new meanings associated with products, services or organisations themselves (Verganti, 2008, p. 440; Jonas, 2011, p. 1). In this sense, RBV makes it possible to consider enterprises from the strategic perspective or strategic entrepreneurship (Foss, 2011, p. 1).

However, as recognised in many research sources, although RBV is a dominant theoretical concept in the strategic management literature, it suffers from several drawbacks. Principally, RBV has failed so far to integrate creative and entrepreneurial processes. This can be traced back to the observed linkage between theories of strategic advantage and theories of creativity and entrepreneurship (Barney, 2001, p. 53). Empirically, there is little known about how firms

differ in their resource bases and how resources are connected to sustained profitability (Armstrong & Shimizu, 2007; Newbert, 2007; Crook et al., 2008). In addition, RBV provides rather an ex-post facto analysis and assessment of successful firms. There is a need to know a priori where assets come from, how they are created and deployed, and whether they will prove to turn into strategic assets. A path-dependency aspect is needed for consideration when delivering success (Connor, 2002, p. 312; Priem & Butler, 2001, p. 22; Dutta et al., 2005, p. 277). According to Arend (2006), RBV is often used to establish context, since independent variables can be brought together and labelled as resources, (p. 412). Resources and performance need to be linked and measured. Measurement is a difficult issue when dealing with tacit and not intangible resources (Poppo & Weigelt, 2000, p. 586; Coff & Laverty, 2001, p. 1). RBV marginalises external market sources; for example, resource endowment coming also as a result of changes in the external environment and the need to adapt and reposition on the market. Time is a crucial factor in RBV, as entrepreneurial success and survival is bound through developed and sustained resources, which will make adapting to the changing conditions in the environment possible (Connor, 2002, p. 307).

3. Methodology

3.1. Research design

Given the research area of design management in micro and small enterprises, the present research design follows the principals of 'methodological fit' (Edmonson & McManus, 2007, p. 1155); that is, the research design complies with tenets ensuring internal consistency among elements of the research project – research questions, prior work, research design and theoretical contributions.

The research approach is exploratory. Exploratory research usually implies a qualitative research approach, since it is concerned with an underdeveloped topic (Shields & Rangarajan, 2013, pp. 26–27). Indeed, qualitative research facilitates the exploration of the phenomenon in-depth or the discovery of new phenomena (Borrego et al., 2009). The choice and adaptation of a qualitative research approach has been justified, carefully taking into account applicable research streams (Neergaard & Ulhøi, 2007, p. 1; Fossey et al., 2002, p. 717), where the qualitative research approach has dominated. The research approach is usually determined by the research question (Creswell, 2002). The present research question does demand an explanation and reasoning of the role of design and its patterns within the organisational context of SMEs. In other words, to provide answers to why, how, who and what are involved in design management. The research approach can also be called a hybrid one (Fereday & Muir-Cochrane, 2006, p. 80), since here the author combines both deductive and inductive streams of conducted research.

In order to explore the role and impact of design, it is necessary to understand the scope of design management and its role for innovations. For this, the researcher employs the design management concept from previous research (Hack et al., 2012), which was initially used to test the impact of design management. Using this basis, the author analyses design integration patterns and the effects the design management process might have on organisations of different sizes. As a result, inductively, a new combined design management model based on real-life practices (SMEs cases) is proposed. As emphasized by Kelley (1999), in the case of design-related discourses, an inductive approach to innovation is rather dominant (p. 32).

3.2. Research methods

The present research employs qualitative research methods, and since it is exploratory and oriented towards indicative reasoning, the case study method was chosen. Two enterprises are used as enterprise case studies, whereas 10 single solutions developed as a response to a specific enterprise-based problem, challenge or idea serve as an individual design-oriented solution for enterprises (further referred to as SME solution cases). The case study method makes analysing specific phenomena possible. It is also crucial in making conceptual models (Eisenhardt, 1989; Miles & Huberman, 1994, p. 101; Stake, 1995, pp. 4–6; Yin, 2009, p. 2; 2012, p. 3). Indeed, case studies dominate research focusing on links between design and innovation and new product development, and are also present in research contributions related to strategic management and business strategy (e.g. Borja de Mozota, 1998, 2003). The case study method, where a given enterprise is perceived as a case study, is linked with other qualitative methodological choices (Yin, 2009, 2013). It is argued to be an appropriate method when exploring design management practices and their role for small businesses and design management networks, as they make tracing links and investigating relationships between interacting structures and units possible; for example, in a given enterprise (Wassermann & Faust, 1994, p. 8; Scott, 2003, p. 38ff; Corbin and Strauss, 2008, p. 123ff). In fact, a case study method makes it possible to catch the particular quality and complexity of a single case (Stake, 1995, p. xi). Svengren recognised the importance of case studies in dealing with design management as opposed to action research (1993, p. 444). With a number of cases, a better comparison can be achieved. Different SME solution cases reduce the critical issue related to validity as well as confronting the model. Indeed, the exploration of several cases facilitates a holistic view of design integration and its impact. It also increases the potential of practical applications of the model and displays of best practices for SMEs outside the regional setting.

Next to case studies, semi-structured interviews were used. The interviews were needed to help verify the results achieved (developed SME solution cases) outside mentoring teams, who were responsible for the development of the solutions. As a result, interviews were made with two external groups: enterprise representatives, and external experts and coaches involved in solution development for SMEs, but being external to mentoring teams and acting rather as advisors to mentoring teams. The semi-structured interviews were undertaken with the enterprise representatives before the design management consultation, in the middle stage of developing the SME solution case, and then after the solution development stage. This enabled tracking the valuation and impact of design integration and its management before, during and after the design management consultation. This made it possible to perceive the design management process and its framework. In total, 15 semi-structured interviews were conducted with enterprise representatives using the developed interview matrix. This matrix addressed issues related to difficulties, challenges, impact and value added from the design management process and its integration within entrepreneurial practices both internally and externally on the market. In the case of the second group, external experts and coaches, 12 interviews were conducted. These interviewees included four renowned design management experts worldwide and eight experts from project partner organisations (two experts per partner from Germany, Poland and Sweden representing different fields of design, business and technology). Specifically, the researcher asked respondents to elaborate on the need for design management in terms of regional development and the SME sector, how experts understand design management, which critical stakeholders are involved in innovation

projects, how they assess SME design management project results (outputs) and inputs (knowledge utilised from the consultancy groups) as well as why we need the interplay of three arrays of design, business and technology.

Finally, in order to track the design management process from the internal perspective (i.e. mentoring teams, who were involved in the SME solution case development process), the researcher interviewed all members of the mentoring (consultancy) groups ($n = 30$) before and after the project with the particular SME. In total, 120 interviews were conducted from two mentoring sessions concerning two enterprises. These mentoring groups consisted of design, business and engineering students, graduates and start-ups from Germany, Poland and Sweden, who had no prior experience with design management, had already worked with design in enterprises or were already running their own individual design-related business, (e.g. freelancing), thereby providing a design consultancy or working as an external designer or expert within an enterprise. In this case, the hybrid mentoring capacity also facilitated the integration of experiences and perspectives from different levels, fields, and academic and practical as well as different cultural backgrounds. In total, 30 mentoring experts divided into five competing groups were assigned to solve a specific problem or develop a solid idea for the individual pilot enterprise (SME). Consultancy groups or innovation developers worked in close cooperation with the particular enterprise when implementing the project. As a result, during the research project, three key terms were introduced – knowledge developers (5 mentoring groups consisting of 6 individuals with different academic, cultural and practical backgrounds), knowledge absorbers (participating pilot SMEs, two enterprises in this particular case), and design management knowledge facilitators (auditors – internal and external experts and coaches).

3.3. Data analysis and management

With regard to data management, all interviews were recorded and transcribed. Together with the research peers, the author interviewed target stakeholder groups: knowledge developers, absorbers and facilitators. The data was analysed using qualitative data techniques, since the research gap concerns the process and framework related to design management in small enterprises that, in turn, primarily targets content. In particular, narrative and storytelling was used. The importance of storytelling is increasing, since it makes it possible to display the design process, and to capture its role and value. Firms have moved from solely offering products to also offering experiences (Beckman & Barry, 2009, p. 152). Therefore, softer aspects as well as hard factors within insights are taken into account to build up a successful design management strategy for the SMEs. To that end, it was important to track the processual aspects related to how design is integrated and managed within the enterprises and what potential results this might lead to.

The body of empirical evidence was subject to a thematic analysis method (Braun & Clarke, 2006). This method uses the design management checklist with key questions to be answered by the mentoring groups from each of the particular fields of design, business and technology. The checklist covers both operational and strategic organisational levels and entrepreneurial practices. In order to evaluate the impact of the implemented design management process (consultation), the author used field notes, diagrams, visualisations of the SMEs' solution cases, memos as well as social network analysis. The narrative results are better perceived by having them available (cf. Annex).

Two SMEs and their problems were dealt with in the project within the framework of the first two training sessions, which took place in 2012 (April and July). This means that during an individual training session, one enterprise and its related problems or challenges were subject to exploration. Therefore, the research findings in the next section present the design-oriented solutions for two different enterprises: one a micro enterprise (up to 5 employees), and the other a small enterprise (up to 50 employees). This exploration was conducted using the conceptual framework matrix (Table 1). Having different organisational scope, the enterprises under scrutiny also differed in their cultural and operational background. Yet, both of them are high-tech SMEs with limited design resources or acquiring external design knowledge.

The rationale behind limiting the study to two SMEs is as follows. The last training session of the one-year training cycle did not specifically involve an SME, but a public organisation (museum). For this purpose, to safeguard the variation and the same entrepreneurial common thread of having two SMEs, without any other discolouration regarding organisational structure (e.g. public organisation beyond the scope and principles of those shared by privately organised SMEs), the author focuses on displaying design management within two enterprises. Having this in mind as well as arguing that design integration is mainly challenged in two SMEs with a focus on technology or business fields, rather than issues of design, the research scrutinises design utilisation and design management in fields that are not governed primarily by graphic or industrial design; for example, the appearance, usability and aesthetics of products, services or systems. Therefore, business and technology fields are the primary challenged fields according to the enterprises themselves.

4. Findings

4.1. Delineation of processual perspective of design management implementation and its framework conceptualisation

The present research delivers a practice-oriented multidisciplinary design management process model for technology-driven micro and small enterprises leading towards increased design orientation and innovation as a result of a design intervention programme. To delineate the model, two SMEs and the implementation of design management consultations with them (i.e. a practical thorough analysis of enterprise performance in technology, business and design arrays), serve as an empirical basis to ground the following inductive reasoning. The feasibility of the model, its principal application and allocation of differing stages is therefore built upon solution cases (in total 10) for two SMEs, as delivered during the design management consultations. These solution cases serve as sources and examples supporting the reasoning of processual aspects of the delivered design management model. They also underpin the storytelling of the design integration process, which was claimed as demanded by topical research scholars, and facilitates capturing the delivered value expressed through design (visual form). For this reason, and taking into account the limited scope of this paper, only two visual examples, implying two different challenges for the two SMEs and the processual design-driven response by delivering two feasible SME-tailored solution cases, are discussed here. The value generation by delivering other SME-tailored solution cases as a result of the design management consultation is summarised by means of a brief narrative or storytelling expressed in matrix form (Appendix 1 and Appendix 2). This is done to safeguard a better balance between the visual and narrative reasoning.

The results of the contents of the design management consultations are presented in Table 1. The author defines this matrix as a conceptual framework, which serves as a design management consultation in order to solve a content-based problem or challenge for a given SME or to utilise the discovered idea or opportunity. It is a scheme that makes up the overall design management process (consultation) implementation. Principally, for future research and other design management consultations, it can be referred to as a principal conceptual framework matrix, which defines who are involved in the design management process, as well as how, why, when, to what extent, for which purpose and with what impact. The author constructs this matrix by adopting project management evaluation techniques and processes. It is believed that its tenets can also be employed within this context. This facilitates tracking the impact of design management within micro and small enterprises. The approach is also useful because purposes, processes, activities, and outputs are to be provided in this context. The incentive can be linked with design integration and contribution on an operational, tactical and strategic level (Holland & Lam, 2014, p. 9). It might also be used as a matrix of the impact of design according to the function that design adopts within the enterprise context (Moultrie & Livesey, 2014, p. 481; Valencia et al., 2013, p. 369), such as product-related and process-related roles. Yet, all agents involved internally and externally within the development of products or services in the enterprise, play a significant role and contribute to the fulfilment of one of the other functions of design for enterprise performance internally and externally. The developed conceptual framework matrix includes both comparative and narrative forms of the deliverables as well as enabling weighting and the synthesis thereof. In order to arrive at a certain solution, which is by the end of the project accepted by the given SME (problem or challenge solving, feasible idea generation, product, service or innovation solution, opportunity transferred into a business model or similar), there is a need for a structured approach. For the research, a structural approach implies the application of a processual perspective on design management and its implementation within an SME. As a result, certain processes, steps or stages need to be undertaken in order to arrive at a feasible solution covering and addressing the entire ecosystem of the given SME. Specifically, these processes, steps or stages need to point to the three fields of an enterprise, namely, technology, business and design. It is argued here that in order to deliver a successful design management consultation, the following approach, as shown in Figure 1, should be employed.

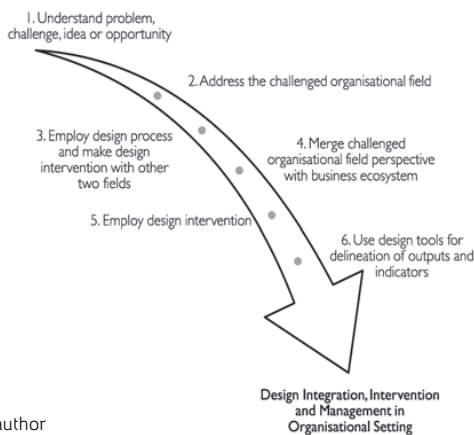
Table 1. Conceptual framework matrix for design management process implementation based on two enterprises

SME scope	SME problem / challenge addressed	Organisational field addressed	Process used	Activities and Tools employed	Outputs and Indicators achieved
<p>SME 1</p> <p>Size: Micro enterprise</p> <p>Entrepreneurial scope: Provider of a fuel cell, which gives heat, air conditioning and electricity through reduced oxygen generation, thus providing an ecological fire protection system.</p>	<ul style="list-style-type: none"> Attracting future customers, i.e. convincing them of advantages of the fuel cell system and gaining greater market penetration through new customers or engagement in new customer networks. 	<ul style="list-style-type: none"> Business problem: Marketing and corporate problem Tactical level: attracting new customers; diversifying customer groups Strategic level: developing new marketing strategy and new business plan Strategic level: improving organisational culture and organisational performance 	<ul style="list-style-type: none"> Merging internal (identifying key resources, capabilities and strengths) and external perspectives (identifying customer needs and target groups) Combining technological output with business performance Increasing the visibility of the product outside Servitising product and enterprise 	<ul style="list-style-type: none"> Business problem as a point of departure Integrating design tool on tactical and strategic level by means of: Graphic design Appearance Aesthetics Communication Product promotion Branding 	<ul style="list-style-type: none"> Strengthened corporate identity Consolidated marketing strategy for product appearance, functionality and usability <i>Design as a strategic resource and process at the strategic corporate level</i>
<p>SME 2</p> <p>Size: Small enterprise</p> <p>Entrepreneurial scope: Heating and ventilation unit producer and distributor</p>	<ul style="list-style-type: none"> Despite successful market performance, difficulties either with the entry of new products to the market or unsatisfactory sales figures after market entry. Search for creative ideas to extend its product line, e.g. devices characterised by increased efficiency. Overcoming minor functional problems with existing products. 	<ul style="list-style-type: none"> Operational problem: technology field (product appearance, efficiency, redesign, functionality and usability) Operational level: product improvement Tactical level: market entry with new products and streamlining product line Tactical level: marginalised sales; diversifying customer groups Strategic level: developing new communication strategy and new business plan 	<ul style="list-style-type: none"> Merging all agents involved in service provision process Analysing step-by-step peculiarities of design, technology and business arrays that stick to a specific product 	<ul style="list-style-type: none"> Technological problem (operational level) as a point of departure Integrating design tool on operational, tactical and strategic level by means of → Product functionality fit to appearance Usability Service ecosystem Scenario building Synthesising Adopting 	<ul style="list-style-type: none"> New appearance of the product provided New service package developed attached to the product Changed product appearance implying the communication message New market entry strategy based on relaunched product appearance <i>Design as a tool at operational level improving product appearance, usability and commercialisation potential through differentiation and targeted customer communication</i>

Source: Compiled by the author

Taking the aforementioned into account, the presentation of the design management process is based on showcasing design management from a processual perspective; that is, deconstructing the design-driven process into specific steps or stages that yield design integration, intervention with other fields and multidisciplinary management. Consequently, the rationale and impact of each stage for the enterprise – improving the organisation's operational, tactical or strategic performance, providing new innovation incentives or similar – is underpinned by discussing applicable solution cases from the two concerned SMEs. The SME solution cases imply a reaction to the problem or challenge as formulated by the enterprise. In order to ensure consistent quality and balance of discussion throughout the entire paper, the presentation of design management from a processual perspective is based on passing through and demonstrating the stages attached to specific design management processes in the two SMEs. Sensitive data belonging to the enterprises are not disclosed. This does not yield any negative impact on the evaluation of the design integration, intervention, management and impact.

Figure 1. Processual perspective of design management consultation and intervention



Source: Compiled by the author

Step 1. Understand problem, challenge, idea or opportunity. This particular stage may differ depending on the given business ecosystem. The important issue here is the challenged organisational field, which is addressed by the enterprise. It becomes an essential and time-consuming interaction when an enterprise is a hi-tech driven business undertaking, the target groups of the enterprise are very specific, or the problem or challenge is not specifically defined by the SME itself. In the case of the regional hi-tech SME (Germany) (SME 1), which produces a fuel cell system combining different functions, the first stage appears to be resource-demanding; in other words, time and a thorough understanding is needed. SME1 proposes a very flexible solution for a range of customers. The system is an installation placed outside facilities (rooms) but connected with building installations (e.g. fire protection system). The key business proposal by the enterprise is to reduce the oxygen content within buildings. Since oxygen serves as one element for fire ignition, its reduction also diminishes the risk of fire ignition. In this, fire prevention is achieved. The system integrates heat, air conditioning and electricity functions through reduced oxygen generation, thereby providing an ecological fire

protection system. Preventing fires also contributes to the reduction of negative environmental footprints, as the additional functionality of electricity, heat production or cooling generation can be achieved based on the same input source in the system (low-content oxygen). The product represents a sustainable, smart and safe solution. The SME faces business growth problem. The key challenge is related to future customers.

SME 2 is a medium-sized enterprise (Poland). The SME operates as an expert on the economical heating and ventilation of industrial objects and utility service areas. It provides solutions, mainly, for medium and large enclosed spaces like warehouses, production halls, supermarkets, sports objects, churches, workshops and car salons. The enterprise's products stem from an established strategy, which steadily helps build the company's competitive advantage based on innovativeness, high quality and partner relations with customers. The key business proposal of the enterprise is the provision of innovative projects and implementing air heating and ventilation products with special attention to the application of progressive industrial design, energy efficiency and unique steering methods. The enterprise aims at being perceived as an expert when helping customers find a well-suited air heating system. However, despite a stable financial situation and continuous cooperation with designers in new product development and investment projects, challenges are faced on the market. SME 2 has difficulties entering new markets with new products or has unsatisfactory sales figures after market entry with new products. In addition, the enterprise sets out the idea of extending its product line, especially taking into account the technological and functional performance (usability) of the product itself. Increasing efficiency or overcoming functional drawbacks of existing products belongs to the objectives as well. Therefore, it might be said that the problem / challenge refers to both technological performance and marketing.

Step 2. Address the challenged organisational field. Taking into account the given problem or challenge, idea or opportunity, it is necessary to understand which specific field the recognised object (problem, challenge, etc.) addresses. This is a necessary precondition before employing the relevant design tools in the next steps. In both SME cases, the problems or challenges target the business field rather than technology or design. Both SMEs are referred to as technology-driven. The recognised needs target either marketing, market penetration or improvement of sales figures. They also have strategic issues, such as business planning, sustainable stakeholder management and similar. Operational drawbacks, such as changes in product appearance or the introduction of new features in the product group, do not dominate the problems and challenges portfolio of either SME. This might imply that from the technological side, the SMEs are employing their technological capabilities; however, the challenges addressed here mean that the technological side appears to be rather decoupled from the appearance (design) and business operational and strategic arrays.

Step 3. Employ the design process and make a design intervention with the other two fields. In this step, it is necessary to perceive and recognise design as an important operational and strategic resource. Acknowledging resources internally and externally from all three fields – technology, business and design – help 'track' product peculiarities – what it is, how it is perceived by the SME itself, externally, how does the product / service function or operate and what can be forecast. It is rather a typical failure made by SME planners or managers to decouple design from technology and business. As observed in SME 1, knowing and following the steps provided in the model above may result in a shortened innovation process cycle, a

better mutual understanding of different agents (designers, business people and engineers who need to work on an innovation project together), improved co-work and specific delivered value. Processual acting also fosters easier conflict resolution, which may arise due to different working languages, methods and the distinct operating cultures among designers, managers or engineers. Finally, it might improve the evaluation and recognition of the SME itself if the core of the SME's performance is decomposed into its individual parts, thus enabling tracking back to the root of the problem or challenge associated with a particular product, service, organisational or marketing issue. Similarly, bearing in mind the overall outcome of the real-life scenarios (solution cases) implemented for SME 2, it might be argued that a very precise predefinition of the challenges or problems by the enterprise makes a more efficient and effective implementation of the design management process possible. It is rather a project management approach that can be applied moving step by step from one point to another. Consequently, solutions are developed in a very structured way by narrowing down the search for the most optimal solution. Nevertheless, such an approach carries risk. The room for manoeuvring and design intervention remains rather restricted since the project management approach is used. As a result, the main focus related to the solution to the problem or challenge is placed on the business field and potential sources for solutions are associated with business. For this, the recommendation refers to finding a balanced way of handling the problem or challenge rather than being too precise and too narrow or giving broad operational boundaries.

Step 4. Merge the challenged organisational field perspective with the business ecosystem.

In this step, the challenge or problem, idea or opportunity should be treated in the particular field. For instance, when there is a business (marketing related) problem, a marketing oriented process should be utilised and design tools integrated. In terms of the SME cases here, SME 1 needs to attract and convince future customers about the advantages of the fuel cell system and to gain greater market penetration through new customers or engagement in new customer networks and markets. This challenge clearly addresses their strategic corporate clout and requires strategic thinking, which appears to be the most extensive and challenging. It is design that is used as a strategic resource to be utilised within the innovation development processes. Taking the internal and external business performance of SME 1 into account, the consultancy groups needed to deconstruct the problem formulation provided by the SME. The key challenge lay in not having a clear understanding of the product itself. Yet, understanding design management as an open process that addresses enterprise issues related to all operational (product), tactical (business planning) and strategic (innovation development and growth oriented) settings, facilitated and accelerated the achievement of the given task. It provides new development directions for the enterprise from a strategic perspective and acts as a stepping stone for developing a new approach for the marketing strategy based on the complex product.

In the case of SME 2, the challenges address either the operational field or are associated with positioning drawbacks. In the first case, the approach requires a change of the form of the product (cases 1–3) or its visual appearance, which would lead to increased performance efficiency and streamlining the 'intrinsic' strength of the product. In the latter, the challenges target the 'external' perception of the product among customers and users, which implies better communication and promotion of products or their performance on the market (cases 4 and 5). Five challenges to be solved are presented in Appendix 2. When compared to SME 1 and its challenge, it is evident that the enterprise from Poland (SME 2) sets out merely to solve challenges related to the product itself (operational level). During the design management

consultation, it was apparent that the enterprise formulated a very precise brief (real-life scenarios) and provided mentoring groups with certain criteria and conditions to be met during the development phase. Indeed, in this regard the room the mentoring groups had to manoeuvre was more restricted than in the case of SME 1. Therefore, in contrast to SME 1, which aimed at developing a marketing and branding strategy based on a clear product idea and product communication, the case study of SME 2 more specifically targets the design field (product appearance, operational level) and aims at developing design solutions with design implementation concepts including cost projections for product design implementation.

Step 5. Employ design intervention. In this particular step, it is necessary to undertake an overall analysis and evaluation of the potential solution for the given enterprise. Here, it is essential to integrate not only design tools but to merge them with the technology and business tools (e.g. those that enable product functionality or exploitation on the market). The different working languages in the design, business and technology fields, as well as the different tools, approaches to processes and different perspectives need to be merged and treated together. It might be highlighted that this particular step is one of the most intensive and challenging ones: in terms of the multidisciplinary working environment, extensive working and implementation, intensive communication with SME representatives, the need to cover the entire business ecosystem when delivering SME suitable solutions as well as the other socio-economic factors to be taken into account. How quickly and to what extent a particular solution can be developed (final market-ready solution or prototype) depends on the complexity of the originally formulated challenge, problem, idea or opportunity, time pressure, heterogeneity of the team, co-work with enterprises, availability and interplay of technological, business and design resources, competencies and capabilities.

Step 6. Use design tools to delineate outputs and indicators. With this final step, as delineated during the research process, in order to resolve the specific challenge or problem, idea or opportunity, solutions are presented to the enterprises involved. Here it is essential to use design tools to visualise the content. The author believes, and this is in line with other research streams confirming, that it is crucial to use visualisation means when exploring design management case studies, analysing and evaluating the role of design for innovations, competitiveness and business growth. For this specific function and to better perceive the design management input, the selected SME solution cases are plotted in the Annex below. At this stage, it is indeed expected that visuals of the proposals are created for the SMEs that yield the overall business solution for the enterprise presenting the value creation, value proposition and value capturing actions.

In the case of SME 1 and the challenge or problem that targets the business, and in particular, the marketing field, the following results of the design intervention were achieved via the technology and design fields and the design management consultation. The author can distinguish two key building blocks in the findings, which can be agglomerated within the specific fields of design: corporate design, communication design, product design and environmental design. All aspects of these four forms of design have been touched upon during the design management process. Yet, it can again be emphasized that the holistic view of the SME can be achieved based on the model used. Particular findings refer to the optimisation of the external environment the SME is operating in as well as concerning internal business operations (i.e. the product and its development). It is argued here that only

by combining both perspectives, is an SME able to transform into a brand based on a sound strategic design approach, integrating the product dimension, which itself integrates the peculiarities of design, business and technology.

The author will now present the results in reference to selected SME solution cases. These were developed based on the same point of departure (Table 1) using different mentoring groups. Taking into account the limited scope of the article, only the most feasible solutions are discussed here. In sum, as is apparent from the results, which to a large extent confirm conclusions in the relevant literature (e.g. Bucolo and Mathews, 2011; Borja de Mozota, 2013, etc.), design might take over different functions and deliver multiple positive effects that in turn can be utilised for the further development of an enterprise.

When compared to other solutions that need further updates, one of the strongest solutions developed by the mentoring groups refers to the well-interconnected fields of technology, business and design. Here, we can see the clear impact of product alignment with technology and communication means, thus delivering a strong message to customers. The solution is based on having explicitly understood the technological peculiarities of the product. This, in turn, implies changes to the original perspective. It is fire prevention rather than fire control that should be put at the heart of the key communication message and marketing strategy. Furthermore, by understanding key technological advantages the product might deliver to customers, the mentoring group is able to enhance the number of target groups, and in this sense, pave the way to achieving multiplier effects that, in turn, generate increased value. As a result, the key message related to the product is supported, and the solution becomes more practice-oriented. Therefore, this specific solution was captured by the enterprise and integrated within its marketing strategy. Moving forward step-by-step, mentors were able to track key peculiarities related to the product, passing from the combination of the technology used from outside, through merging the technological strength with core internal enterprise strengths (key resources, capabilities and capabilities that enable to achieve key competitive advantage), towards integrating respective target groups that are subject to fire prevention. Finally, the solution case also integrates the perceived and embodied values, beliefs and perceptions of potential customers (target groups) attached to the product outside the company (i.e. on the market). Accordingly, it might be argued here that the marketing strategy is based on the coherent and reasonable outcome of the design management process, addressing all the necessary processes, tools, product interdependencies, technologies, as well as the appearance and perception of the product both internally in the enterprise and externally on the market.

As a result of solution case 3 developed for the company, the effect of the design management process is also clearly visible in time lapse. Three years beyond the project, the enterprise is still building its marketing strategy upon solution 3. The key message is the output delivered by using this technology – first, fire prevention, and second, other value add-ons that are delivered next to the fire prevention solution.

By echoing the CEOs of the company as a result of the interviews conducted after the solution was delivered, the achievement is in compliance with the values, brand and strategy the enterprise is pursuing:

We recognised two key issues: The first refers to how we need to communicate our company externally. Which direction does the company want to pursue? Who do we want to appeal to? Which message should be used to do this? Therefore, we understood that we should not address the end target group, but multiple groups (here, referring to planners of buildings, building / construction projects, etc.). The reasoning behind this is the following: they speak the same

language. Moreover, intensive building projects are associated with very precise marketing strategies and measures. After having recognised our target group we do want to take advantage of the network we have. We contacted a local company that has the contact details of the key planning offices. As a result, we can contact these directly, i.e. taking advantage of the value added chain, thus saving expenses and time. Otherwise, we need direct contact with potential customers. We started to address such questions as what should our message be about? What would we like to communicate? In what sense is the product subject to change based on the needs and demands of planners? In sum, the management process affects the design process. This is because based on the decisions taken by the management (new target group(s) identified), the product needs to be changed. Participation in the project led to conducting a professional target group analysis. Furthermore, we have reflected upon the product we sell. Consequently, we came to the conclusion that we sell fire protection with added-value, i.e. additional features. You are protected from fire and simultaneously can enjoy further advantages, such as having a source of energy.

In sum, the messages above imply design integration as a process and its impact on process-based solutions. Subsequently, SME 1 solution cases 1, 2, 4 and 5 and their results are summarised in Appendix 1. This is table bears in mind the page limit for the article. Nevertheless, all solutions were subject to a content analysis of design management and a synthesis of the results on the impact of design on the enterprise.

In the case of SME 2, and the tailored outputs and indicators that can be presented as a result of the design management consultation, showcasing the impact of the design intervention, it might be emphasized that within solution case 1, where the clear task was to redesign the blades of the air heater by changing the air directors, the need for a new design was seen by the enterprise as a result of adapting the blades to a different product (air heater) within one product line (LEO). Different lengths of blades are usually used in different products within the LEO product line. The current system with the option to fit the blades is based on springs that do not always work well. In addition, there is an essential need attached to the product design, more specifically, reducing production costs. As a result of this problem, the most challenging issue for the design management team was to comply with the enterprise brief – to develop a new blade concept that changes the air directors, includes a visualisation of the solution and cost calculations. After struggling with the brief and having recalled the real need during the design management process, in particular, linking product design with technology (i.e. performance and functionality) as well as taking into account the issue of the additional costs resulting from the new blade concept, the mentoring team decided not to prioritise the given brief by the enterprise, but to develop a product that meets the needs related to appearance, function, usability, performance and marketing (distribution on the market).

Therefore, after having explored the real problem behind the challenge, the mentoring group came to an innovative conclusion. It provided an air heater without any blades visible on the outside. The step-by-step exploration of the problem demonstrated that designing new blades would be a costly undertaking. The mentoring team recognised that, apart from directing the air, the blades had no real function. This provided the impetus to remove them and leave the air heater without blades. During brainstorming, the engineers from the mentoring team insisted on keeping the blades that fulfilled the role of directing the air. Based on input from the industrial designers, who felt responsible for the aesthetic function of the air heater, it was agreed to perform this function using simple aluminium blades hidden inside the air heater. In this respect, a positive outcome can be reflected through the new definition and

conceptualisation of the rather traditional and classical perception of the air heater. This implies a break from traditional discipline rules and the combination of design, technology and business perspectives concerning the product.

Next to the change within the product, the mentoring team proposed further solutions linked to the additional conditions of the brief set by the company – issues for solving the problem of product fittings as well as cost challenges related to the entire product line. In this respect, the mentoring team came up with a modular, flexible system that makes it possible to link frames together. In addition, this solution points out the challenge of the fittings, since the proposal creates more stability (than using springs) and saves additional costs. As described by the mentoring team:

The aesthetics of the visible part of the product could be inspired by the pictures given, bearing in mind creating a pattern, which could be effectively replicated and mass-produced in all the different sizes of the product range.

The external unit of the product should have one fixed shape / form, which should be easily manufactured for cost and transportation reasons (conclusion by mentoring team 1).

Taking into account the overview of the findings for SME 2, further solutions target integrating design into the business and technological fields, interactions within new product or service developments, or even redesigning products. In addition, marketing related problems are also solved. All solution cases 1–5 are summarised after the implemented content analysis in the results Appendix 2.

4.2. Delineation of design management model by merging content and process perspective

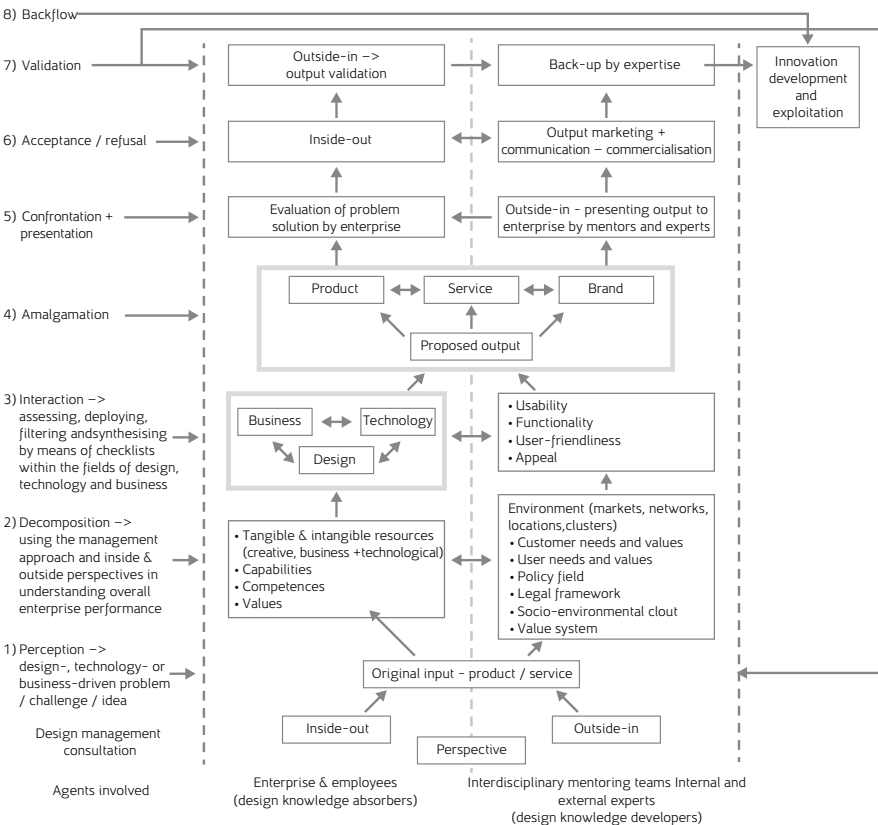
As a result of the design management consultations (processes) with two SMEs, the model proposed in Figure 2 (see below) is a result of thorough analysis and exploration based on two SME cases. Although the model is subject to sustainability issues (i.e. needs to be tested and adapted in forthcoming design management related projects or consultations given to enterprises), its contribution to the implementation of a small-scale short-term design management project (consultation) is evident.

The model implies an amalgamated design management process integrating both inside-out (enterprise internal) and outside-in (performance on the market and externalities) perceptions. Based on the processual perspective designed and implemented in two SME cases (Figure 1, section 4.1), the proposed model is referred to as a comprehensive framework, which includes not only specific steps or stages to be undertaken, but also integrates all stakeholders, actions, indicators and desired solution proposals that could be envisaged by enterprises and design management teams. This model provides a merged perspective for understanding ecosystems and implies the recognition of opportunities for technology-led micro and small enterprises that usually do not possess the specific design knowledge, skills and competencies to undertake a design management consultation. This is especially true when deploying external sources (e.g. designers and experts in design or innovation). Yet, it also applies to internal applications, where the enterprise has a designer involved in product or service development projects. Indeed, this model focuses on a rather marginalised issue. It addresses the step-by-step processes and frameworks involved in how to employ tools from the technology, business and design sectors, what challenges and opportunities are faced within

development processes and what impact these processes may have on organisations. It is argued that this model reduces the research gap recently acknowledged by Bucolo and Matthews (2011) and Yström and Karlsson (2010).

In order to undertake effective and efficient design management consultations using interdisciplinary mentoring teams, there is a need for a structured approach (Figure 2), which starts with stage 1 – perception. This is an especially crucial issue when implementing highly demanding design management consultation projects or projects at short notice when urgent demands from the enterprise can be expressed as a result of internal or external events (e.g. in the case of changed regulations and the need to promptly adapt the product to a new legal environment). Indeed, this change requires products to comply with new environmental regulations or similar. However, a certain room for manoeuvring should be left for mentoring teams. As it is apparent from the findings discussed above, enterprise problems, challenges or ideas that are too broadly defined may lead to rather vague results (products, services, organisational or positioning processes), which are hardly likely to be accepted by the enterprise as being very innovative.

Figure 2. Design management process model for innovations and growth



Source: compiled by the author

This was already pointed out by Kotler and Rath, who highlight that a common mistake in management is to bring designers into the development process too late or to bring the wrong type of designer (Kotler & Rath, 1984, p. 19). Bearing this tenet in mind, the author stresses that in stage 2 – decomposition, it is a necessity in today's development process to emphasize that neglecting the coherent, consistent and simultaneous interplay of the creative, business and technological realm may jeopardise business performance. This, in turn, impedes concrete performance gains. By not bringing the designer in at the first stage, when the idea generation process occurs, but when the product development process has already been carried out, can have severe implications. For example, it is extremely difficult to change the design-related attributes, such as logo, enterprise name or marketing activities, when an enterprise is already operating on the market.

Comparing the second training session with SME 2, which proposed very narrowly defined problems, the interdisciplinary mentoring teams faced much greater challenges than in the case of the solution cases from SME 1. This can be traced back to the fact that the mentoring teams struggled in order to meet the conditions and requirements set by SME 2 in each of the real-life scenarios. Yet, during stage 3 – interaction, which includes assessment, deployment of technological, business and design resources, competencies and capabilities, filtering, reasoning and synthesis, the mentoring teams faced either compliance with the enterprise brief or changing the brief itself. In cases where the brief is adapted or changed based on the 'actual' enterprise or market needs, mentoring teams are capable of delivering better and more solid solutions. These are therefore grounded on a reasonable and feasible linkage and amalgamation of the peculiarities of the design, technology and business fields, which form the delivered product, service, organisational or positioning related output. Therefore, tools that are commonly shared by designer, engineer and manager can be employed as a helpful measure for mentoring teams. The developed real-life checklist for the analyses in the design, technology and business fields serve here as a valuable tool for mentoring teams in moving forward during the design management consultation process. This appeared to be especially helpful when the mentoring team became stuck in the development process.

Understanding enterprise performance within all three fields – technology, business and design – enables the combination of key competitive product defining characteristics. This happens in stage 4 – amalgamation. Only when the form, aesthetics and appearance of the product (service) are combined with the technological performance (efficiency and engineering prolificacy) of the product, might a feasible product (output) result and be accepted by the enterprise at the end of the design management consultation project in stage 5 – confrontation + presentation. Here, product usability and functionality expressed in form (design) and adjusted to the internal and external business environment – cost efficiency, material utilisation and exploitation on the market – must be secured simultaneously. Although the point of departure – problem, challenge or idea – differs from field to field (i.e. one being business-led (SME 1), and the second design-led (SME 2)), the solutions appear to be feasible, and are therefore validated by the enterprises and can be exploited in the market through implementation at stage 7 – validation. This particularly applies to cases where the design field is efficiently and effectively merged with technology and business, thereby providing no room for critical argumentation or refusal by the enterprise or experts at stage 6 – acceptance or refusal.

Based on the above discussed design management process model, which is reflected through application with two SME cases, a generic (universal) model can be deduced, which is applicable in different businesses. In sum, using the problem, challenge or idea, design management

consultation passes eight stages (1–8). It starts with understanding the enterprise in the entire ecosystem, decomposing its key competitive strengths and its performance in the design, technology and business fields, moving forward towards understanding how customers and end-users perceive the enterprise and how it performs on the market. Afterwards, using the given tools and methods, mentoring teams aim at efficiently and effectively connecting different parts of the deconstructed enterprise. Here, again, three fields come into play: design, technology and business. Appearance, style, form and aesthetics (design) are merged with performance, functionality and engineering prolificacy (technology) and adapted to the customer, user and market needs. Compliance is necessary between usability, functionality, user-friendliness, environmental friendliness and appeal, which, in turn, are to be reflected in the product design, technology and business approach. After the interaction phase, where resources, capabilities and capacity are deployed, an amalgamation can be implemented. This is done by combining different parts into the proposed output – be it product, service, brand, organisational or positioning output. Subsequently, a presentation session takes place with the enterprise and external experts, and the final decision is made by the enterprise itself. To this end, an evaluation from outside the enterprise might be needed in order to validate the feasibility of the proposed solution. The output, when accepted, is subject to marketing and communication measures to be implemented on the market. When validated internally and having received external backing, the output can be commercialised and exploited. When exploited, it leads to innovation: either disruptive or incremental.

Indeed, this implies that within the product development, design cannot be detached from technology and business, even in small-scale development projects. This is a particular issue to be addressed in the organisational context. Since technology-led enterprises, particularly micro or small enterprises, usually do not have design competencies and tend to concentrate on their state-of-the-art technology and engineering prolificacy, the impact of design should not be neglected. As shown here by the empirical data, in neither solution developed for SME 1 or SME 2, did design play a marginal role. By contrast, it is rather design that plays a driving role in overtaking such functions within the project that concern both product and process fields. Design can be seen as a crucial strategic resource that enables differentiation from competitors. Design is also an entrepreneurial competency and capability. Where an enterprise does not possess design resources, it can acquire design knowledge and competencies through implementing the design management model (consultation). The consultation then passes through the stages as shown in Figure 2. Using an external consultancy through projects or financial support programmes, or even by designating the enterprise's own resources for such design management projects, the enterprise might absorb design-related knowledge and in time learn how to utilise this knowledge in combination with technology and business. As a result, the design orientation becomes visible. In all solution cases ($n = 10$), design played an important role and was not ignored during the design management process. In addition, design, when efficiently combined with technology and business, may spur innovation potential and serve as a stepping stone for innovation to emerge. In the majority of the cases covered, the design potential for innovation was evaluated ranging from medium to high. This implies that when developing a product or service, or conducting an organisational streamlining or positioning project, innovations, whether disruptive or incremental in nature, can be an effective outcome when exploited by the enterprise on the market. Innovations also emerge as a result of a common, linked, cooperative approach, where internal and external perceptions are merged and integrated into product or service development.

In addition to the universality of the design management model, it might be claimed that research results have found topical proponents among other researchers. The processual approach here merging content and process perspectives when integrating design, making design interventions with technology and business arrays and managing the intervention process, can be used to replace two prevailing research streams: a) understanding design management as a core of the design process and aiming to improve design within management tools, or b) designing the management process and integrated design tools, and language and methods into corporate management projects (Cooper and Junginger, 2011, p. 539; Borja de Mozota, 2006, pp. 45-46). The author claims it is rather a consolidated approach that helps to realise innovation potential, enables interdisciplinary communication, while learning and respecting the methods, knowledge and language utilised in different disciplines. Inputs from all are needed in product development. This is clearly in line with the research in this field. In his later research, Borja de Mozota (2013) highlights again the need to integrate more management tenets into the field of design management, as there already exists a variety of literature based on design theories: design project management, design strategy, managing a creative team, and others. By contrast, what is needed in interdisciplinary design management and thus research is to merge the design perspective with management using approaches from organisational management (p. 305). There is a need for a better partnership between design and management (Johansson & Woodilla, 2008, p. 1). This viewpoint is supported by the research results achieved here: in merging design, technology and business within enterprise development to achieve better performance. These endeavours, the same, as in the preceding research contributions, are justified via the integration, analysis and evaluation of case studies (Borja de Mozota, 2013, p. 305). Bringing the topical setting with environmental, social and economic challenges into the frame, Romme (2003) proposes organisations should develop in the manner of design. They need to establish communication links between design and science (management). In this, scholars will be capable of guiding human beings in the process of designing and developing their organisations towards more humane, participative and productive futures, thus making a difference to our current situation (p. 558).

6. Concluding observations and future implications

The proposed design management model delivers a multidisciplinary and processual perspective on integrating design into the organisational (technology-led SME) setting. By implementing the model, enterprises that lack design resources can increase their design orientation and innovation as a result of the design intervention programme. To this end, enterprises need to pass through stages that cover design integration, design intervention with technology and business realms and the management of multidisciplinary interactions. These interactions are needed in order to improve product or service, or organisational or positioning processes, and realise innovation potential to be exploited on the market. This model can also be utilised for those aiming to develop new products and services.

With the proposed model, the research contributes to topical research streams. It provides a model for SMEs waiting to build up, enhance and employ design resources and capabilities for innovation, competitiveness and growth. In terms of practical contributions, the research delivers a grassroots practice-oriented step-by-step model, which can be applied in various business settings. In this, the research enhances the design management contributions for

SMEs, since SME-oriented design management research has been referred to as marginalised. Design management can be reflected as a process-based approach and framework integrating different internal and external stakeholders. The structured approach is helpful when conducting short-term design management consultation projects on demand. Even if it provides a structured way of proceeding, certain room for manoeuvring is left. The key message remains the integration of design, technology and business and the assurance of consistent linkage of these arrays throughout the project. In this case, innovation potential is easier to grasp. Interdisciplinary work and merging of internal (enterprise) and external (market, customers and users) perspectives can help realise innovation potential.

This research contributes to reducing the research gap, as management science views are largely integrated within a design management model that does not solely build upon the design perspective. The model can be easily replicated in other design management projects or programmes. It is an efficient way of approaching a clear problem, challenge or idea and delivering a feasible output together within an interdisciplinary team on board. By providing this tool, agents are able to understand and benefit from each other by understanding different tools, methods, languages and techniques.

A practical contribution is evident through the findings achieved in the framework of the project as well during the showcasing of the findings of the first two training sessions. In the future, as a result of the drawbacks mentioned regarding SMEs as the backbone of our economy in Europe, this model should be tested in other technology sectors, and especially with different sizes of enterprises and numbers of enterprises. A clear research limitation is that this study is based solely on two SME cases. It is therefore recommended that the next step should test the construction of the model using a larger sample of SMEs in order to explore its feasibility, identify potential changes and ensure its sustainability. Continuing future research could reveal the real strength of this model in developing innovations and utilising resources, capabilities and competencies in a most efficient and effective way for SMEs, thus becoming an accepted management and organisational practice.

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Appendices

Appendix 1. Design integration and impact on organisational performance of SME 1

SME 1 – original setting		Design in Operational setting	Design in tactical setting	Design in strategic setting	
<i>Challenge – attract customers and increase market share</i>				•	
<i>Objective – developing marketing strategy based on the complex product</i>		•		•	
Design impact after training session – result of design management consultation					
Solution	Solution message	Design on organisation level	Design function	Innovation form	Innovation potential and realisation (adaptation) impact
Solution (case) 1	<ul style="list-style-type: none"> Changing the visual message in the enterprise promotional material – integrating 'bee concept' and 'cell concept' Changing the marketing concept 	<ul style="list-style-type: none"> Strategic level Marketing and brand 	<ul style="list-style-type: none"> Process-based – communication of information to external agents (customers and market) and among the product fields – merging appearance, functionality, technology and purpose of the product for the target groups, incl. marketing message 	<ul style="list-style-type: none"> Process-based Positioning (branding) 	<ul style="list-style-type: none"> Medium The concept of cells is rather disrupted from the technological and design (appearance) field The use of honeycomb does not yield the full linkage of aesthetics, functionality and application within business
Solution (case) 2	<ul style="list-style-type: none"> Changing the message – from fire control to fire prevention 	<ul style="list-style-type: none"> Strategic level Marketing 	<ul style="list-style-type: none"> Process-based – marketing message; visualisation as a result of changed message (slogan); promotion of product and service; graphic design; language design and semiotics 	<ul style="list-style-type: none"> Positioning – marketing and communication 	<ul style="list-style-type: none"> Low Changing of the communication strategy implied changing of the visual corporate identity Too many changes on the corporate level associated
Solution (case) 3	<ul style="list-style-type: none"> Enhancing customer (target groups) and changing the key message of the product and thus the marketing strategy 	<ul style="list-style-type: none"> Strategic level Marketing and customer management incl. new market penetration opportunities 	<ul style="list-style-type: none"> Product-based – defining new values for potential customers (projecting experience) Process-based – communication of product advantages to new target groups 	<ul style="list-style-type: none"> Organisational process – streamlining organisational development Positioning – enhanced due to new customers and links addressed 	<ul style="list-style-type: none"> High Linked product functionality to customer needs and adopted with the marketing strategy SME has transformed components of the solution to its marketing strategy
Solution (case) 4	<ul style="list-style-type: none"> Clarifying and presenting product advantages and visualising product groups incl. their utilisation areas 	<ul style="list-style-type: none"> Strategic level Marketing and communication 	<ul style="list-style-type: none"> Product-based –> facilitating new product application fields Process-based – communication of product advantages to the market and customer groups 	<ul style="list-style-type: none"> Product-based Positioning 	<ul style="list-style-type: none"> Medium Missing prioritisation of product advantages and application fields
Solution (case) 5	<ul style="list-style-type: none"> Providing communication strategy aligned to the key product message 	<ul style="list-style-type: none"> Strategic level Marketing and communication 	<ul style="list-style-type: none"> Process-based – communication of product key message 	<ul style="list-style-type: none"> Positioning (marketing) 	<ul style="list-style-type: none"> Low Developed strategy limited to communication and visual presentation disruptive from the corporate identity and strategic orientation

Source: compiled by the author

Appendix 2. Design integration and impact on organisational performance of SME 2

SME 2 – original setting	Design in Operational setting	Design in tactical setting	Design in strategic setting
Challenge 1 – design a complex solution for new air directions of blades in air heater	•		
Challenge 2 – design new Oxen rotating heat recovery system instead of an existing cross-flow system	•		
Challenge 3 – develop a complex concept for a larger air conditioner	•	•	
Challenge 4 – solve a challenge of product innovativeness on the market			•
Challenge 5 – new market entry strategy incl. communication and marketing strategy			•

Design impact after training session – result of design management consultation

Solution	Solution message	Design on organisational level	Design function	Innovation form	Innovation potential & realisation (adaptation) impact
Solution (case) 1	<ul style="list-style-type: none"> Changing the product appearance attached to technology – no blades needed for air heater 	<ul style="list-style-type: none"> Operational level Technical design → design for performance and functionality 	<ul style="list-style-type: none"> Product-based – defining new product appearance as a result of technological performance 	<ul style="list-style-type: none"> Product-based Service-based 	<ul style="list-style-type: none"> High Appearance clearly linked to design and business approach – saving costs to introduction of modularity function and reduction of materials to be used
Solution (case) 2	<ul style="list-style-type: none"> Proposing new target group for the product Proposing new opportunities of servitisation through individualisation New market niches 	<ul style="list-style-type: none"> Tactical level Communication design Marketing Promotion of social and experience values 	<ul style="list-style-type: none"> Process-based – marketing message; visualisation of new target groups and servitisation; graphic and user-centred design 	<ul style="list-style-type: none"> Product-based – user involvement and communication of user experience (usability) Positioning – market, communication of product values on the market 	<ul style="list-style-type: none"> Medium Changing of the communication strategy implied changing of the visual corporate identity Too many changes on the corporate level associated
Solution (case) 3	<ul style="list-style-type: none"> Increasing airflow performance incl. changed design – switch to modular system 	<ul style="list-style-type: none"> Operational level Technical design → design for performance and functionality Strategic level – new value proposition incl. service for customers 	<ul style="list-style-type: none"> Product-based – changed product aesthetics Process-based – communication of product advantages to customers and value-oriented target group targeting 	<ul style="list-style-type: none"> Product-based – changed appearance Positioning, marketing, communication of values 	<ul style="list-style-type: none"> High Linked product functionality to technology and customer needs Potential for efficiency improvement on design, technology and business field

Solution (case) 4	<ul style="list-style-type: none"> • Rethinking and re-designing communication strategy incl. optimisation for corporate identity and value proposition 	<ul style="list-style-type: none"> • Strategic level • Marketing and communication Tactical level – new business planning • Operational level – changing product language and visualisation 	<ul style="list-style-type: none"> • Product-based – facilitating new product appearance and language • Process-based – communication of product values, customisation; diversification of application areas and customer groups; differentiation of product 	<ul style="list-style-type: none"> • Product-based • Service-based • Positioning, marketing 	<ul style="list-style-type: none"> • High • Differentiation and diversification opportunities of the product yield spur innovation potential
Solution (case) 5	<ul style="list-style-type: none"> • Providing strategy for new market entry in China incl. discovery of market potential 	<ul style="list-style-type: none"> • Strategic level – marketing, customisation and communication • Operational level – adapting product appearance to the existing culture and values 	<ul style="list-style-type: none"> • Process-based – marketing and communication 	<ul style="list-style-type: none"> • Product-based – changing aesthetics and style • Positioning (marketing) • Organisational – expansion opportunities 	<ul style="list-style-type: none"> • Medium • Changing the perspective of product demand on the targeted market – rather cooling than heating

Source: compiled by the author