ABEJ

Politechnika Warszawska
Warsaw University of Technology

Applied Business and Economics Journal

e-ISSN: 2956-7432 | 2023 Vol.1 pp. 24–45 | doi: 10.61089/abej.2023.1.23

Qualitative factors of design management effectiveness. Empirical research on a representative sample of Polish enterprises

Ewelina Sokołowska [1] Anna Dziadkiewicz [2]

[1] University of Gdansk, Faculty of Management, Department of Corporate Finance

[2] University of Gdansk, Faculty of Management, Department of Marketing

Received:
14 December 2022

Accepted:
29 May 2023

Published:
23 September 2023

Abstract:

The concept of design management has appeared in the literature on the subject relatively recently. It falls within the scope of innovative enterprise management processes, having a very significant impact on enterprise functioning and development, as confirmed by the results of an empirical study conducted on a representative sample of Polish enterprises. These results constitute a new contribution of knowledge to the theory and practice of enterprise functioning in Central and Eastern Europe and provide a new perspective on the factors affecting enterprise development. The results of the study carried out take into account not only the quantitative factors but also the impact of the qualitative factors that can define those enterprises' competitive advantage. The purpose of the article is to present new knowledge on the functioning of enterprises using design management, and to identify factors determining their condition and survival in the era of environmental change. It should also contribute to further discussion and research on the evolution and development of design management processes.

Keywords:

design management, qualitative factors, representative sample, Polish enterprises

ARTICLE

1. Introduction

Since the dawn of time, technological advancement, specialization, and diversification have constituted the foundation of social progress. These processes result in a variety of products and services. In the 21st century, economic, social, and cultural transformations have originated the changes in the demands of entrepreneurs, who increasingly often have been trying to find prospects for developing competitive advantage in their cooperation with clients. Most of the process and service sale is no longer understood as the former purchase and sale transaction. Competitive advantage is determined by mutual respect, understanding, and willingness to co-create, which increasingly have been taking into account the respect for the natural environment and the care for the society. In light of this assumption, design management (DM), in a user-oriented approach, refers to such company's activities, processes, and decisions, which ensure the best fitting of new or significantly-improved products and services to the needs and aspirations of the recipients whilst taking into account economic, environmental and social values.

For many years, linking design management with business has been marginalized or undervalued compared to other management concepts (sic!).

Nowadays, due to the events taking place in the economy, which often are of evolutionary and unpredictable nature, this approach is prospering. Design management is therefore comprehended not only at the microeconomic level but increasingly often at the regional, national, and transnational levels. Its role as a key factor driving economic development and competitive advantage has been reflected in the reports of the European Commission and numerous studies commissioned by various government agencies. As a result, the strategic value of design is becoming visible to a progressively wider public, outside the creative sector as well.

With the above in mind, the authors set the goal: the presentation of new knowledge on the functioning of enterprises using design management, as well as the identification of factors determining their condition and survival in the era of environmental change.

2. The theory of design management - a literature overview

In the light of the above considerations, it can therefore be postulated that, in the conditions of the 21st century economy, design management that lead to the creation of additional value for both the company and the client has been a valuable method of organization development. A small number of scientific studies, research reports, or the good practices presented confirm that, despite its significance, the approach has not been widely used, as design management is often difficult to define and understand.

The knowledge presented in the literature on the subject of organizational changes resulting from opportunity identification and organizational processes and organizational culture is

scarce (Matthews and Bucolo 2011; Borja de Mozota 2003; Holland and Lam 2014; Gemser and Leenders 2001). This primarily results from the completely interpretations of the processes associated with the understanding of the role of design in the 20th century: design then was focused on the outcomes of enterprise activity: products, interior design, and external communication.

Currently, the area of design has transformed, and it encompasses designing understood as a process. It leads to a change which involves creation of the buyers' experience, construction of new emotions, introduction of sustainable activity within the company, and creation of lasting values, based on interaction with the market.

Design Management is the space between the science of design and the science of management. It is not a popular discipline and often is neither supported nor understood, both by the managers as well as the designers.

So what arguments justify its existence? Analysis of numerous studies presented in management-related literature allowed the Authors of this article to specify the most important ones. Despite the fact that management schools and art schools have never collaborated, the science behind the approach has been included in regular study programmes at the best business universities in the world, including the Royal College of Art and the Imperial College Business School in London, the 'd.school' at the Institute of Design, Stanford University, the Parsons School of Design in New York, and the Business Design Studio at the Rotman School of Management in Canada. What is more, managers are not interested in aesthetics nor in the use of the tools that are available to designers – the Western culture and the educational system supporting it gave primacy to ideas over actions, spiritual things over material things, conceptualism over pragmatism, and logic over intuition. Managers forget that it is the material products that dominate their world and inspire their way of thinking. They are unable to appreciate the meaning of 'things' and thus perceive design as an overarching auxiliary activity. As early as in 1989, Tom Peters advised designers to invent tools for design management measurement, thereby making it the only path for the implementation of design in enterprises and acceptance of the concept on the part of company management. It was not until the beginning of the 21st century that research in the field of design management began, which led to the development of models and indicators (Borja de Mozota 2006; Borja de Mozota, 2011; Westcott et al. 2013). The general inability to intuitively comprehend English, common in the countries of Central and Eastern Europe, has led to theoretical and cognitive errors - design management is translated as project management or industrial design management, which in turn leads to incorrect understanding on the part of the managers overseeing design processes.

The Authors also notice another barrier constituting an important debating point prompting further research. So far, only sparse initiations of studies on the effectiveness of design management in the SME sector can be found in the literature on the subject, as examined by Dziadkiewicz (2020). As Buchanan (2004) wrote, "design that fails to understand the critical

importance of accounting, finance, human relations, strategic planning and vision building is doomed to irrelevance" (Buchanan 2004).

Design management, just like design itself, has been evolving. In the past, the design function was limited to specific industries and companies, i.e., fashion, architecture, automotive, interior design, and interior furnishings. Currently, activity in design management is also noticeable in industries such as tourism, education, IT, and digital industries.

In 2011, an article was published in Design Issues, in which it was noted that design, only to a small extent (or not at all), corresponds to the global trends in research and innovation (Hobday et al. 2011). From year to year, however, design management has been integrating words that are commonly used in management, such as brand, leadership, strategy, value, change, and innovation, and has been turning into a management discipline. Accordingly, definitions that most fully describe the essence of the approach are presented below.

As specified by the Design Management Institute, design management encompasses ongoing processes, business decisions, and strategies, which enable innovation and development of effectively designed products, services, communication, environments, and brands, which in turn improve the quality of life and ensure organizational success (Design Management Institute). It aims to combine design, innovation, technology, management, and the customers to provide competitive advantage in three areas: economic, socio-cultural, and environmental. It also entails the principles of management, which make commitment to 'good design' of key importance (Bernsen 1990). This good design, mentioned by Bernsen, has also been described by Gorb, who understands it as design agency management, teaching design, teaching design for managers, project management, and organization management. Design Management is the design space within the company structure as well as the changes necessary to improve this relationship (Gorb 1990). DM also entails the management of the company's visual system (development of products, services, documents, visualizations) and the coherence of all design areas with regard to the brand design strategy (Borja de Mozota 1990). Best pointed out that it is the business side of design (Best 2010).

DM determines the use of resources based on processes, strategies, and competencies, which are divided between the structure and the perception of the company (Wolff & Amaral 2016). It should be integrated into the structure at three levels: the functional, the visual, and the conceptual (Svengren 1995). Blum (2017) sees DM as an activity aimed at process redesigning in organizations, in accordance with the principles, methods, the attitude, and design philosophy adopted. Summing up, design management is made up of four themes: the creation of value, problem solving, improvement of the company's design skills, and development of project leadership to achieve the company's goals. Table 1 summarizes the above considerations.

Table 1. The evolution of design management processes

PERIOD	1965 - 1992	1993 – 2005	2005 - 2014	2015 - 2018
DM creates added value by...	Economic value (Aesthetics, Differentiation) Product value (Quality) Perception Value	Process Value Coordination, Problem-solving)	Human value (Human and cultural transformation)	Strategic conversation value (Building skills, Framing problems)
DM solves problems relating to…	All aspects of company´s artifact	Managing innovation	Strategic diagnosis Changes in society, politics	Cultural changes Digital transformation Design for all
DM develops and enlarges design skills in the function of….	Direction Marketing Operations Communications	R&D Interdisciplinary innovation team	Finance Human Resources	Every function in the company
Design leadership (design direction, artistic direction) helps the accomplishment of goals such as…	Create a brand and an identity (coherence between design disciplines) Create profit for the company	Create new products and services Improve the innovation process and its efficiency	Make companies aware of design strategy Change for customer oriented and creative culture	Make a company sustainable in a globalized context of societal well-being

Source: adapted from Cooper et al. 2011

As indicated in Table 1, the concept of design management was formalized as an individual domain only in the second half of the 20th century, but the tasks related to DM have been present ever since the first corporations started to invest in design. Up to the 1960s, DM was mainly concerned with the management of the aesthetic elements of design in relation to the products and the corporate brand.

Over the years, the design functions have been systematized, in order to authenticate the production carried out. Checklists and quality control tools began to be used. In the 1980s and the 1990s, design managers became professionals whose contribution to the company's success became more understandable, while the center of design management gravity entered the zone of strategic management. Design began to interact with production and marketing at the highest levels in organizations. Nowadays, design has become a proactive strategic tool and entails creation of an environment for innovation and market leadership, not the need to respond to the market trends.

3. Dataset and metodology

Due to the intensive development of design management in developed countries, an attempt was made to evaluate this process in Poland, the largest country in Central and Eastern Europe. The processes taking place in Poland constitute a pattern of behavior observed in smaller countries across the Eastern border and in other countries that underwent the transformation process much later. In order to obtain answers, a questionnaire was developed and subsequently, a representative sample of Polish enterprises was examined. Based on the literature on the subject and the Authors' own experience gained during the conduction of training in the field of design management, 40 potential determinants were identified, followed by a survey addressing 22 issues.

The aim of the study was to obtain answers from respondents concerning the occurrence of individual conditions and the level of that occurrence in enterprises, as well as their impact on the development of design management processes. The results obtained were subjected to principal component analysis (PCA)[1], in order to develop scales consisting of joint questions and, at the same time, characterized by high accuracy.

The first stage of the research process (the period from 1 December 2018 to 1 March 2019) entailed the conduction of a diagnostic survey. Due to question standardization, collective and comparable data was obtained, enabling analysis of a wider group of enterprises. This study was carried out via the CATI method (a standardized structured telephone interview conducted using a computer) used on randomly selected medium and large enterprises in Poland. The interviews involved people who deal with designing, are responsible for the decision-making process in the organizations (owners, management, etc.), cooperate with designers or are managers of such departments as R&D department, project department etc. 1074 enterprises participated in the study, including 781 medium-sized enterprises and 293 large enterprises. The sample met the criteria of a representative sample.

Additionally, 128 companies were invited to an in-depth interview, 58 of which agreed to participate further in the research. The companies were selected intentionally, whereas the selection criterion was the level of design management maturity - the mature phase, and the size criterion - a large enterprise.

The decision to select large enterprises was made on the basis of the results obtained via a study on a representative sample and a pilot study. These results indicated that most advanced design management processes occur in large enterprises. For this purpose, a standardized direct structured interview was used.

[1] Principal Component Analysis (PCA) is a method of factor analysis, meant to, inter alia, reduce the number of the variables describing given phenomena and identify the regularities between the variables. It entails determination of the components which are a linear combination of the variables examined. Thorough analysis of the principal components enables identification of those initial variables that have large impact on the appearance of individual principal components, i.e., those that make up a homogeneous group. The principal component (in which the variance is maximized) is then a representative of this group, inter alia, [in:] Czopek 2003

The choice of the PAPI technique was dictated by the complexity of the issue, which resulted in the need to expand the questionnaire to 32 questions and 12 cafeteria-style questions.

3.1. Dataset

The study was divided into three parts and encompassed the following stages:

- identification of the conditions,
- data collection,
- data analysis.

3.2. Methodology and results

Design management is the enterprise development process leading to optimising its organizational performance. It aims to result in the generation of value for the client by combining business with the creative sphere. To achieve this, it is necessary to determine many different factors of various significance levels for the enterprise. They will influence not only the achievement of the goals but also the quality of the processes developed.

In order to determine these factors and examine the level of their impact on enterprise functioning, principal component analysis (PCA) was used. It is a method of factor analysis, which enables the reduction of the number of the variables describing given phenomena and the identification of the regularities between these variables. It is based on the determination of the components, which are a linear combination of the variables under examination. A thorough analysis of the principal components enables the identification of those initial variables that have a large impact on the appearance of individual principal components, i.e., those that make up a homogeneous group. The main component (in which the variance is maximized) is then a representative of this group.

4. Assessment of the design-management determinants

Figure 1 presents the scree[2] identifying the number of design management components related to the organization's determinants.

[2] The scree plot is used to identify the number of factors in the factor analysis. The interpretation consists in the finding of the point from which a gentle decline to the right in the eigenvalues begins. This method is inaccurate, but beneficial when avoiding fragmentation and when the survey questionnaire contains many questions [in:] Czopek 2003.

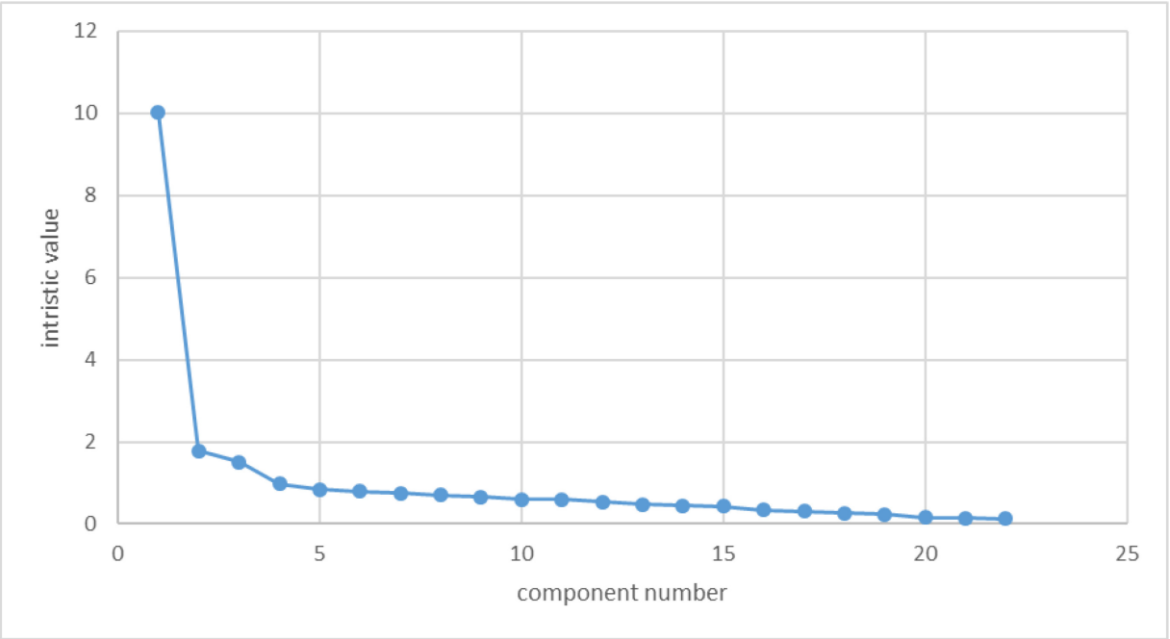

Figure 1. The screen obtained via analysis of the main components that are relevant to the determinants of design management
Source: own elaboration based on the research results

Implementation of a systemic approach in an enterprise requires its individual components to form a jointly organized whole. The factor that synthesizes an organization is the managerial personnel, who has the ability to manage and build relationships between the scattered and not always obvious elements. Appropriate combination and allocation of these elements allow the achievement of rational management and enterprise development. As such, the most important condition for the implementation of a systemic approach is the ability to manage the resources effectively and efficiently. It should be emphasized that the set of internal factors is identified with the 's strategic resources and its ability to use them to carry out activities entailing a response and reaction to the changes and transformations in the external environment. Using the Kaiser criterion (the factor eigenvalue being greater than 1, since smaller values do not differ significantly from individual variables), three areas of interest have been distinguished, which are presented in the matrix of rotated components[3] (see Table 1), namely:

1. The competency-related determinants pertaining to human resources, its potential and experience;
2. The organizational determinants related to the activities and processes taking place in the organization and the operational efficiency within the resources of a business, creative and technological nature;
3. The management-related determinants that are dependent on the company's managerial abilities.

A summary of the results is presented in Table 2.

[3] Orthogonal varimax rotation was used, which forces the lack of correlation between the areas selected, which results in the fact that each area can be interpreted independently of the others.

Table 2. The rotated factors matrix obtained via analysis of the main components of design management determinants

Determinants of design management within an organization	Components		
	1 (organizational determinants)	2 (competency-related determinants)	3 (management-related determinants)
Assignation of an appropriate rank to the process of design management in an organization	0.84		
Ability to identify the current and future innovative needs within the scope of product, process, organizational and economic innovations	0.41	0.70	
The managerial personnel's support for the design management approach			0.83
The managerial personnel's ability to develop a program (a set of undertakings) and optimize it			0.83
Having a dedicated cell or person working as part of design management	0.74		
Openness to learning about design management, as well as training support and consultancy in this area		0.83	
Awareness of the benefits introduction of design management offers for both the company and the employees		0.41	
Design management at every level of the organization	0.85		
Involvement of the management board in the design management process			0.78
An organizational culture conducive to the implementation of design management		0.75	
Clearly defined procedures and modes of design management implementation	0.75		
Openness to new trends and innovations on the part of the management board			0.47
Rational expectations on the part of the management board regarding the effects of design management			0.72
Well-functioning internal communication	0.44	0.49	
Conduction of design management evaluation	0.54		0.44
Linkage of design management with the company's strategy	0.43		0.57
Ability to design innovative solutions		0.72	

Determinants of design management within an organization	Components		
	1 (organizational determinants)	2 (competency-related determinants)	3 (management-related determinants)
The management board's openness to development and creativity			0.51
The flat and flexible structure of the organization	0.83		
Resource balance (the creative, the technological, and the business potential)	0.43		
Ability to maintain balance in a triple guiding line (social equality, economic value, and ecosystem quality)	0.44		
Openness to the continuous process of building customer-centricity	0.61	0.44	

Source: own elaboration based on the research results

Based on the results obtained via the study, it should be emphasized that the dimension pertaining to competency-related determinants has explained 18.01% of the variance, the second dimension, pertaining to the organizational determinants, has explained 28.9% of the variance, the third – management-related determinants - 16.9% of the variance, while the last one – the human-resource-related determinants – has explained 7.8% of the variance. This confirms the expediency of the research method applied. The high reliability of the measurement, measured by the Cronbach's reliability analysis[4], should also be noted, since it allowed determination of the relationships between the motifs making up a given set of determinants. The Cronbach's coefficient for competency-related determinants was 0.79, for organizational determinants - 0.91, and for management-related determinants 0.70. It can thus be concluded that the measurement accuracy is satisfactory or even high. measurement, measured by the Cronbach's reliability analysis[5], should also be noted, since it allowed determination of the relationships between the motifs making up a given set of determinants. The Cronbach's coefficient for competency-related determinants was 0.79, for organizational

[4] Cronbach's alpha is a measure of scale measurement reliability. It is based on internal compliance, indicating the degree of linkage between individual variables and a given concept. The calculation of reliability is based on the correlations between variables. When they fall within the range from 0 to 1 and additionally approach 1, the scale has higher reliability (the scale is considered satisfactorily reliable when its Cronbach's α statistic is at least 0.7). It is also believed that very high results (over 0.95) may indicate that the questions measuring the scale were constructed in the same manner. Questions, therefore, should be constructed in various manners, e.g. [in:] Tavakol & Dennick 2011.

[5] Cronbach's alpha is a measure of scale measurement reliability. It is based on internal compliance, indicating the degree of linkage between individual variables and a given concept. The calculation of reliability is based on the correlations between variables. When they fall within the range from 0 to 1 and additionally approach 1, the scale has higher reliability (the scale is considered satisfactorily reliable when its Cronbach's α statistic is at least 0.7). It is also believed that very high results (over 0.95) may indicate that the questions measuring the scale were constructed in the same manner. Questions, therefore, should be constructed in various manners, e.g. [in:] Tavakol & Dennick 2011.

determinants - 0.91, and for management-related determinants 0.70. It can thus be concluded that the measurement accuracy is satisfactory or even high.

4.1. Organizational determinants

From the research results obtained, organizational determinants constitute the most numerous group of motifs occurring within an organization. Table 3 presents descriptive statistics for individual motifs determining the proper functioning of the design management model. They have been ordered according to the frequency of occurrence (from the highest to the lowest extent) in the enterprises surveyed.

Table 3. Descriptive statistics for organizational determinants

Motifs	M	SD	Mo	Me
Ability to identify the current and future innovative needs within the scope of product, process, organizational and economic innovations	56.60	29.10	52	45
Clearly defined procedures and modes of design management implementation	54.20	31.30	50, 60	50
Design management closely linked to the company's strategy	51.80	29.40	45	50
Design management at every level of the organization	48.80	34.20	50	46
Conduction of design management evaluation	46.20	34.90	60	40
The flat and flexible structure of the organization	45.10	32.50	50	45
Assignation of an appropriate rank to the process of design management in an organization	44.80	41.30	40	45
Well-functioning internal communication	44.20	32.00	40, 45	45
Openness to the continuous process of building customer-centricity	43.80	32.90	45	40
Resource balance (the creative, the technological, and the business potential)	43.10	39.50	30	35
A dedicated cell or person working as part of design management	41.90	34.00	40	30
Ability to maintain balance in a triple guiding line (social equality, economic value and ecosystem quality)	41.20	29.20	30	35

M – average value, SD – standard deviation, Mo - mode, Me - median
Source: own elaboration based on the research results

When analyzing the results presented in the above table, it can be indicated that the most common determinants, among all the identified ones, are those pertaining to the ability to perceive the needs around innovation, both the current and the prospective ones. This determinant, which is based on the company's development strategy, the customer feedback, the technical and economic analyzes of the company, or the results of R&D works, seems to be correct, if only because it shows the need to understand the company's situation in terms of its potential, but not only. It also concerns the ability to 'track down' those weaknesses, shortcomings, certain gaps inside the company that can inhibit the company's activity, cause its inability to meet the market challenges, and, consequently, result in its lagging behind the competition.

The ability to recognize the need to build an innovative potential determines the effectiveness and efficiency of the enterprise's entire innovative activity. It encompasses all its departments that are responsible, among others, for research and development, marketing, production, personnel management, financial management, etc., and creates opportunities that can be oriented at solving the current and future challenges that the company faces. Resources alone do not guarantee the implementation of innovation.

Companies should possess the skills and procedures necessary to transform their manpower and resources into values. An organization's ability to innovate depends on its potential and the decision-making powers of the managerial personnel, which should be clearly defined in the company's business model. Moreover, understanding both the future and current needs is largely related to the ability to assess these needs, and, therefore, to their measurability, but also to the ability to measure the processes, values and the resources already possessed as well as those needed. As such, this motif can be summed up with an acknowledgement of the need for organizations' self-awareness - a term which seems to entail the essence of the process maturity in an organization.

Clearly defined procedures support teamwork, promote creativity and divergence during the development of alternative solutions, as well as encourage customer focus. They are oriented at decisions based on reliable information, not assumptions or hunches, which is often the case in enterprises. What is more, they allow process evaluation. Customer focus covers the overall process of building an organization that is based on design management, starting from the technological and organizational preparation of the design processes (e.g., based on the hexagonal design management model) through production, the introduction of new technological methods and means of production, participation in new product testing on the market, and finishing with the technical and organizational support in the implementation of new products and services, in order to create customer-centricity in the organization.

Another aspect pertains to the procedures and methods of design management implementation. It is closely related to the ability to identify current and future innovation needs. It entails the measurability of the management-activity implementation through design at the operational, tactical, and strategic levels, as indicated by the following factor. The inclusion of design management in the organization's processes in organization favors leadership development in the market and effective management systems. It improves the flow of information and leads to continuous learning, through which quality and value-related

goals can be timely achieved. It is worth adding that design, at the operational level, is responsible for the current design, focusing on project management and teamwork. The tactical level entails the inclusion of design in the process structure of the business (structuring) – specification of how to coordinate projects, how to manage the employees' potential in terms of their skills and competencies, how to create high-level cooperation systems, and how to support projects. Design, at the strategic level, is the provision of direction for the processes in a company, the striving to make its vision more realistic, and the confrontation with new user needs.

One strong determinant is the transformation of the hierarchical model of management into a flat and flexible operational model, enabling the development of individual initiatives, independence, and the courage to take risks. It turns out that regardless of the employees' age and profession, they feel more at ease in a 'flattened' environment rather than in a 'rigid' hierarchical one. A flexible structure entails the implementation of customer-oriented management as well as project-based and quality-based management, each linked to design. Resource balance thus not only means the material and immaterial potential, but also the ability to find common ground for the designer and the other employees in matters of selling value development, the ability to implement and manage processes, and the ability to define each member of the enterprise through the prism of these merits.

The role of intra-organizational communication is indisputable, regardless of the approach to management and the concepts discussed. The ability to use the staff's creative potential and the ability to cooperate with the management is manifested through the identification of the internal barriers that inhibit creativity and mutual cooperation as well as through undertakings that reduce barriers, through increasing the interest of economic and marketing cells in the development of technology, design, and business, in the area of the company's operation, in order to facilitate mutual cooperation, the staff's preparation for the implementation of marketing functions in the field of products and services, preparation and development of an R&D activity system, along with its implementation, through direct involvement of the managerial personnel in the management of technical and organizational innovations. Here, attention should also be paid to the role of well-designed messages. It is the messages through which the company presents its goals and intentions to employees. It is important to understand that design-oriented companies do not make money by selling their products well but by helping customers make the right purchasing decisions. This seemingly slight semantic difference is, however, extremely important in business. The energy of enterprises implementing design management is not focused on the sales systems or the marketing activities but on learning the customer needs and expectations as well as the way users make purchases. Creative thinking is therefore carried out from the outside to the inside of the organization, not as in typical profit-oriented organizations - from the inside out. In order to instill a customer-centric approach, companies should start with the resource balance, which, apart from the environmental determinants, constitutes the base level of the design management model. Parallel to the resource level, to create customer-centricity, it is necessary to define the mission, vision, and strategy, considering that these are practical tools and should only be treated in such a way. Without a clear definition of identity and a defined and

implemented strategy, it is impossible to clearly communicate the direction or principles on which the company is based.

4.2. Competency-related determinants

The second set of determinants comprises competence-related determinants. They include, among others, openness to learning design management. This factor is closely related to apprehension of the benefits arising from management by design, creation of organizational culture, ability to design innovative solutions, or ability to identify innovative needs, such as well-functioning internal communication or openness to the customer-centricity process.

Table 4 presents descriptive statistics for competency-related determinants. As in the case of the descriptive statistics for organizational determinants, they have been classified according to the degree of occurrence in the enterprises examined.

Table 4. Descriptive statistics of competency-related determinants

Motifs	M	SD	Mo	Me
Openness to learning about design management, as well as training support and consultancy in this area	61.20	21.50	50, 75, 80	65
Ability to identify the current and future innovative needs within the scope of product, process, organizational and economic innovations	61.10	20.90	60	60
Awareness of the benefits introduction of design management offers for both the company and the employees	60.50	21.50	65	60
Ability to design innovative solutions	59.40	21.40	60	60
An organizational culture conducive to the implementation of design management	59.20	24.70	60	60
Well-functioning internal communication	58.90	21.50	60	55
Openness to the continuous process of building customer-centricity	58.50	26.90	50, 70	50

M – average value, SD – standard deviation, Mo - mode, Me - median
Source: own elaboration based on the research results

When analyzing the importance of competency-related factors, it can be concluded that the need to expand competencies primarily results from the need to understand the new business direction, design. This need results from the awareness that a strategy based on price competition or competition on the basis of a product portfolio do not affect market development and does not always guarantee competitive advantage. Business transformation entails access to and the ability to use new tools and methods that so far only designer-artists and designer-engineers have been using but which foster creative thinking. The most common

benefits associated with the introduction of design management processes, as reported by entrepreneurs, include ability to offer higher-quality products and services at a lower cost, the possibility to change the organizational culture to one that promotes the creation of innovation, faster recognition of new enterprise development perspectives, increased operational efficiency, higher production efficiency, better communication with the internal and the external environment, as well as a permanent improvement of the user's relations with the brand, visible differentiation from the competition, better brand and offer consistency.

The results of the research indicate that the most important determinants are openness to learning design management as well as training support and consulting. It seems to be a key factor without which no design management initiative can work. Openness to design management is closely related to qualifications and skills (or the understanding of the need to acquire them) as well as to the position of the person responsible for organization and the course of the design management process. Appropriate training, experience, and external consulting help develop an attitude of an expert characterized by high personal authority, specific managerial and organizational predispositions, ability to create an atmosphere of creative cooperation among the staff or within the entire organization. What is more, continuous acquisition of knowledge allows the process and the object of design management to be shaped effectively, as well as enables accurate formulation of the goals and tasks, not only for specific units, but for the entire organization as well (impact on the company's development strategy). Concurrently, it enables the development of a teamwork plan, division of tasks, and creation of communication systems facilitating information flow among the staff, the management, the stakeholders, and the customers. Openness to learning is closely related to the apprehension of the benefits design management provides at all levels of activity: from the operational level through the tactical level, ending with the strategic level.

The above-mentioned openness to learning allows skillful determination of the current and future innovation needs in terms of products, processes, and organizational-economic innovations. Another equally-highly-rated factor was the awareness of design implementation benefits, not on the part of the management but the entire staff. These benefits may apply to various areas of company operation so that the resultant products and services become more attractive, effective, useful, and customer-desired.

The ability to design innovative solutions is closely related to the organization's potential, which is characterized by creative and well-prepared engineering personnel, personnel with economic and sociological education, and support personnel. The personnel should be proficient in problem-solving skills and the use of creative thinking techniques (e.g. design thinking), management, and the ability to build diverse teams. It should also have knowledge of the current situation, the trends and the design methods.

The determinant formed around an organizational culture that is conducive to the implementation of design management was ranked as high as the ability to design innovative solutions. Such organizations are said to be driven by design (design-driven organizations) or are design-oriented. Here design is not comprehended by employees in strictly visual (styling) or design (process) terms but as a strategy and a way of thinking.

With regard to an organizational culture conducive to the understanding of design as an innovation focused on recognizable needs, four pillars should constitute the base of considerations.

Another two conditions, i.e., well-functioning internal communication and openness to the continuous process of building customer-centricity, have been discussed in connection with the issue of market conditions. In this case, they are based on the staff's competencies.

4.3. Management-related determinants

Management-related determinants constitute a set of factors that are dependent on the attitude and the decisions of the managerial personnel. In the case of design management, which is not only the domain of one cell, but also a function pertaining to the process of entire organization management, these conditions are extremely important for design-based implementation of the entire business management process. Thus, the condition determining the success of all activities in the field of design management is the management board's support. Table 5 presents the determinants at the management level.

Table 5. Descriptive statistics for management-related determinants

Motifs	M	SD	Mo	Me
The managerial personnel's support for the design management approach	62.60	32.40	55, 68	62
The management board's involvement in the design management process	62.30	21.30	60	61
Rational expectations on the part of the management board regarding the effects of design management	60.50	20.90	55	65
The managerial personnel's ability to develop a program (a set of undertakings) and to optimize it	59.40	30.10	45	60
Conduction of design management evaluation	59.20	26.50	48, 64	60
Openness to new trends and innovations on the part of the management board	58.80	30.00	60	65
Linkage of design management with the company's strategy	58.40	25.60	55	62
The management board's openness to development and creativity	58.10	20.80	58	68

M – average value, SD – standard deviation, Mo - mode, Me - median
Source: own elaboration based on the research results

The most frequently indicated determinant pertained to the support of the design management approach through the appropriate selection of the personnel, in terms of their competencies and the profession structure. This would not be possible without the management's awareness of the need to implement the constructive design.

Support, at the management level, is tantamount to the board's involvement in the design management process, which means that the highest-level personnel not only promote design activity among employees, but is a contractor and a propagator thereof, subordinating all decisions to the design management at the highest level of the Design Maturity Ladder. The management board is seen as an entity to follow, and which shows the direction of design management. Trust in the personnel and openness to cooperation, make the processes durable and effective. Despite its many responsibilities and lack of time, a board of directors actively contributing to design develops partnership and authenticity.

The managerial personnel's involvement can be understood as the ability to provide financial resources for creative activity and efficient management thereof by increasing the revenues generated from the company's business activity and the revenues for R&D and innovation, calculation of the costs of design works and development of a cost base, recognition of the possible ways to co-finance development works, conduction of a specific grant policy, e.g., EU subsidies, identification of the sources, the possibilities and the costs of support, the use tax reliefs and other support options associated with scientific and research activity. This point is closely correlated with another determinant, namely the management's openness to the employees' development and creativity.

It might seem that the above-mentioned openness is synonymous with being sensitive to trends and innovations. Meanwhile, it entails, on the one hand, the creation of a platform for creative team cooperation, inter alia, through training, mutual learning, prototyping, and open communication. On the other hand, it is associated with observing the market and the changes taking place in it, followed by searching for ways to adapt the enterprise to these changes.

The management board's rational expectations regarding the effects of design management seem to be crucial. Attentiveness to transparent and complete information on the benefits of both the design management and the reason for implementing the approach is conducive to developing a common respect for work, mutual communication, and unlimited exchange of views.

The ability to develop a program and to optimize it involves a set of activities that encompass the material, financial, and human resource planning, intra-organizational projects, and those carried out with business partners, specification of the material, the organizational and the economic consequences for the enterprise. Full involvement in the activity planning is possible when the participants of design management processes have an influence on the course of these processes and feel responsible for them. They are then more willing to report their availability and willingness to help, to commit their time and adjust other activities to the planned new ones.

Conduction of evaluation, as a determinant of design management implementation, has been discussed in connection with the issue of market conditions; nevertheless, the supporting reasons for the inclusion of design management in a company's strategy are worth presenting. First, no innovative process can take place without the management's decision. Proper recognition of the company's situation, in relation to other companies on the market, followed

by decisions of strategic importance, expressed in the form of a specification of the market success opportunities offered by a new product or service, is crucial.

The inclusion of design management in an organization's operating strategy entails:

- adoption of a course of action and specification of the goals to be achieved via design management (profit, sales, market share, brand positioning);
- examination of the chances for market success and its limitations;
- an impulse to start the process of new product or service development;
- specification of innovations, along with justification thereof;
- allocation of the resources necessary to introduce new products or services;
- designation of an appropriate person, e.g., a representative of the board who is the so-called product champion;
- preparation of a client brief;
- preparation of a development plan for a new product or service.

It should be remembered that the SMART method ought to be used each time when setting strategic goals - they must be specific, measurable, achievable (conditioned by the management board's rational expectations regarding the effects of design management), constitute a specific value and have a precisely defined time horizon. These goals should be communicated to and understood by all employees.

5. Discussion

Competence-related determinants were given by the respondents a slightly lesser rank, although still a high one. This is understandable because only with the potential of experienced staff, innovative solutions that can fully meet the expectations of the market can be introduced. Even though management-related determinants were ranked the lowest, their level is still very high. Without the management's approval to introduce creative thinking as well as cultivate an appropriate organizational culture and open communication based on mutual respect, adaptation to the principles of design management would not be possible. Figure 2 presents the average values of determinant levels in the enterprises surveyed.

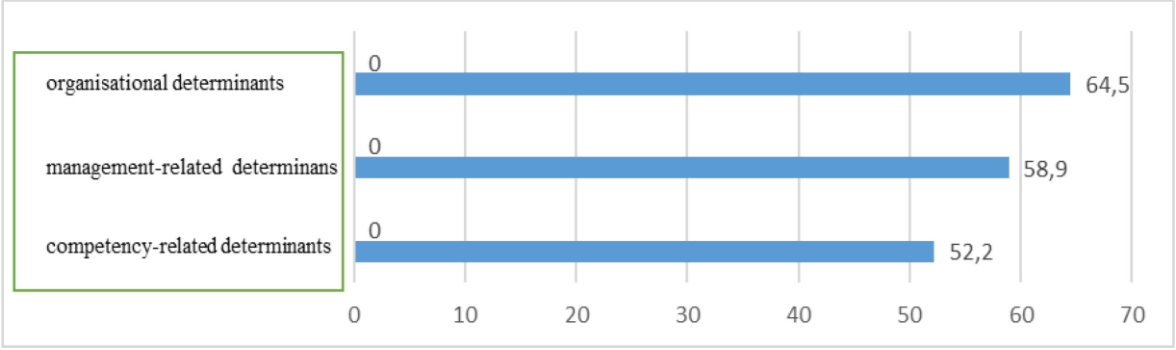

Figure 2. Average levels of determinants in the enterprises under examination (in %)

Source: own elaboration based on the research results

It should be added that, based on the analysis of intra-group variance results[6], it has been noted that the differences between individual sets of determinants are statistically significant $F(1.98; 117.21) = 4.32$, $p < 0.01$, $\eta^2 = 0.14$, whereas the strength of the effect obtained was moderate. The level of organizational determinants was statistically significantly higher than that of competency-related determinants $p < 0.01$ and management-related determinants $p < 0.05$. As such, in each of the cases examined, a regularity occurs, i.e., organizational determinants are higher than the set of competency-related and management-related determinants. It can, therefore, be assumed that organizational determinants are of key significance for design management effectiveness in an organization. This was subject to detailed verification during the development of the design management effectiveness model.

Bearing in mind that the enterprises surveyed vary in terms of the number of employees, the analysis of internal determinants was carried out with regard to the size of the company based on the data presented in Table 5. The size-based division was as follows:

- enterprises employing 250-500 persons – 41 enterprises, 71%;
- enterprises employing over 501 persons – 17 enterprises, 29%.

Table 6. presents the average value results for selected areas of design management determinants in enterprises of various sizes.

Table 6. Average value results for selected areas of design management determinants in enterprises employing less than 500 persons and more than 501 persons

Determinants	Enterprises employing 250-500 persons			Enterprises employing over 501 persons		
	M	Mo	Me	M	Mo	Me
organizational	67.70	63, 65	62	64.30	68	60
competency-related	61.30	60	64	52.30	55, 60	70
management-related	59.40	65	64	62.20	62	60

M - average value, Mo - mode, Me - median

Source: own elaboration

[6] Intragroup variance analysis, commonly known as repeated-measure analysis, is a method that allows comparison of several measurements, carried out on the same group of people, which is formed by the so-called dependent groups. In such analysis, a group of people is tested several times, while individual repeated measures constitute separate measurement groups. The repeated measures are an extension of the Student's t-test for dependent samples. In the Student's t-test, however, comparison of up to two measures can be made, while in the variance analysis - two or more measurements can be carried out for the same group. If the result is statistically significant, it means that significant differences occurred between the levels of the design management determinant areas identified. The measure of the strength of the effect was the eta-square value of η^2, which can take values from 0 to 1, where 0 indicates a situation in which the division into groups is completely unrelated to the apparent variability of the results, whereas 1 (that is 100% of the variance explained) is basically a theoretical limit, since it is only possible to obtain when all persons within a single group get the same result and when, in at least one of the groups, the result is different than in the other groups, where 0.02 indicates a weak effect, 0.13 – a moderate one, and 0.26 – a strong effect See: Richardson 2011.

Competency-related determinants occur to a greater degree in companies employing less than 500 persons. In these companies, competency determinants constitute the second group of determinants, after the organizational ones, while in very large companies (employing over 501 persons), the strongest group of determinants are the organizational ones, followed by management-related ones. Competency-related determinants constitute the lowest-rated group of determinants. It can, therefore, be concluded that in very large enterprises, investments in design reach such a large extent and take on the nature of radical innovations that the management board's decisions are crucial for the course of design management processes.

6. Conclusions

The goal presented in the paper has been achieved - the principles of operation of enterprises using design management are presented, and the factors determining their condition and survival in the era of environmental changes are identified. Summing up the research results, it can be noted that, out of the intra-organization determinants, organizational determinants exhibit the most significant degree of occurrence. The respondents recognized these as crucial for the introduction of design management. Such selection on the respondents' part does not raise any doubts, especially when design covers all processes in a company, not only the product styling. Acting as a managerial function, it plays a role superior to that of other activities in a company.

References

Bernsen, J. (1990). Twelve Principles of Design Management. In M. Oakley (Ed.), *Design Management. A Handbook of Issues and Methods* (pp. 85-95). Blackwell.

Best, K. (2010). *The Fundamentals of Design Management*. AVA Publishing.

Blum, G. (2017). Éléments de réflexion sur le design et le management. *Le Libellio, 13*(4), 61-68. http://hdl.handle.net/20.500.11794/17144

Borja de Mozota, B. (1990). Design as a strategic management tool. In M. Oakley (Ed.), *Design Management. A Handbook of Issues and Methods* (pp. 73-84). Blackwell.

Borja de Mozota, B. (1998). Challenge of Design Relationships: The Converging Paradigm. In M. Bruce & B. Jevnaker (Eds.), *Management of Design Alliances Sustaining Competitive Advantage (*pp. 243-260). Wiley.

Borja de Mozota, B. (2003). Design and competitive edge: A model for design management excellence in European SMEs. *Design Management Journal Academic Review* (2), 88-103.

Borja de Mozota, B. (2006). The Four Powers of Design: A Value Model in Design Management. *Design Management Review, 17*(2), 44-53. https://doi.org/10.1111/j.1948-7169.2006.tb00038.x

Borja de Mozota, B. (2011). Design Strategic Value Revisited: A Dynamic Theory for Design as an Organizational Function. In R. Cooper, S. Junginger & T. Lockwood (Eds.), *The Handbook of Design Management* (pp.276-293). Berg Publishers.

Buchanan, R. (2004). Interaction Pathways in Organizational Life. In R. J. Boland (Ed.), *Managing as Designing* (pp. 54-66). Stanford University Press. https://doi.org/10.1515/9780804767439-006

Czopek, A. (2003). Analiza porównawcza efektywności metod redukcji zmiennych – analiza składowych głównych i analiza czynnikowa. *Studia Ekonomiczne,* (132), 7-8.

Design Management Institute. (n/d). *What is design management?* Retrieved January 9, 2023, from https://www.dmi.org/page/What_is_Design_Manag

Dziadkiewicz, A. (2021). *Design Management. Uwarunkowania i efekty wdrożenia w przedsiębiorstwie.* Wydawnictwo Uniwersytetu Gdańskiego.

Gemser, G. & Leenders, M. (2001). How integrating industrial design in the product development process impacts on company performance. *Journal of Product Innovation Management,* (18), 28-38. https://doi.org/10.1016/S0737-6782(00)00069-2

Gorb, P. (1990). *Design Management: Papers from London Business School*. Architecture and Design and Technology Press.

Hobday, M., Boddington, A., & Grantham, A. (2011). An Innovation Perspective on Design. Part 1. *Design Issues, 27*(4), 5-15. https://doi.org/10.1162/DESI_a_00101

Holland, R. & Lam, B. (2014). *Managing Strategic Design*. Palgrave.

Matthews, J. & Bucolo, S. (2011). Do programs to improve business performance in small and medium manufacturing enterprise improve opportunity recognition? In A. Maritz, (Ed.) *Regional Frontiers of Entrepreneurship Research 2011*: *Proceedings of the 8th AGSE International Entrepreneurship Research Exchange* (pp. 999-1009). Swinburne University of Technology. https://researchbank.swinburne.edu.au/file/7b9f1462-8d06-4797-b90d-7ff5114c946c/1/PDF%20%28Published%20version%29.pdf

Richardson, J. (2011). Eta squared and partial eta squared as measures of effect size in educational research. *Educational Research Review, 6 (2)*, 135-147. https://doi.org/10.1016/j.edurev.2010.12.001

Svengren, L. (1995). *Industriell design som strategisk resurs: En studie av designprocessens metoder och synsätt som del i företags strategiska utveckling*. Lund University Press.

Tavakol, M. & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education* (2), 53-55. https://doi.org/10.5116/ijme.4dfb.8dfd

Westcott, M., Sato, S., Mrazek, D., Wallace, R., Vanka, S., Bilson, C., & Hardin, D. (2013). The DMI Design Value Scorecard: M A Design Measurement and Management Model. *Design Management Review,* (winter), 10-16. https://doi.org/10.1111/drev.10257

Wolff, F. & Gonçalves Amaral, F. (2016). Design Management Competencies, Process and Strategy: A Multidimensional Approach to a Conceptual Model. *Strategic Design Research Journal, 9* (3), 145-154. https://doi.org/10.4013/Sdrj.2016.93.02