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Classification of competencies in design management: Individual, collective and organizational levels

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Abstract
Design management, both in the academic and the corporate world, is being perceived as a strategic element for organizations. However, the role of professional designers and their competencies in design management are little explored. Thus, the goal of this text was to emphasize how competencies are related and joined in the design management sphere, identifying possible interrelationships. A systematic literature review of applied and exploratory nature was made, mapping the state of the art about competencies in design management. Virtual databases were used for seeking work, based on the keywords "design management" and "competence". Through this study, we identified the current state of the art of the topic, as well as the understanding of design management related to individual, collective, and organizational competencies. Emerging concepts related to design management and competencies, such as learning, capabilities, resources, knowledge, value, interactions, communication, collaboration, market context, organizational culture, organizational structure, work processes, and stakeholders involved.

Keywords: design, competencies, design management, intervenient factors.

Introduction

Increasingly, design management has been perceived as a strategic program for organizations, gaining recognition as a multidisciplinary activity, that involves participation of different stakeholders and work teams, with specific competencies (Borja de Mozota, 2003; Libânio and Amaral, 2013). Borja de Mozota (2003, p. 71) conceptualizes "design management is the implementation of design as a formal program of activity within a corporation by communicating the relevance of design to long-term corporate goals and coordinating design resources at all levels of corporate activity to achieve the objectives of the corporation". Libânio *et al.* (2016, p. 151) stress "the design professional is a key player in this process, since he is responsible for the understanding, occurrence, and encouragement of these integrated and multidisciplinary actions". The authors also highlight that design management definitions are proposed emphasizing the levels of organizational activities, participating agents, as well as the functions and manners of action of these agents.

Several features are listed for the design manager, such as leadership, entrepreneurship, vast technical knowledge, specific competencies, managerial abilities, pro-active profile, capacity to coordinate, in addition to being motivating and capacity to influence the team. According to Bruce *et al.* (1999), one of the key aspects for good designers is the retention of certain competencies, arguing that the absence of these is a major cause of failures in design projects.

From the understanding and importance of fostering the integration of teams and internal arrangements in organizations, it is proposed the debate about competences and related concepts. The mapping of competencies allows them to be stimulated and developed at the individual and collective level and thus, the design management is executed and implemented in organizations. So, the competencies of individuals, teams and organization are decisive for the occurrence of design management. In this context, this study aims to map the current situation of research on competencies in design management, stressing possible interrelationships.

Theoretical background

Competencies

The concept of competence, according to Dias *et al.* (2008, p. 12) "is predominantly focused on performance, contextualized mobilization, and contribution of work to the company's strategy". Retour (2012, p. 287) defines competence as "a validated operational know-how". For Ruas (2005), the concept of competence is related to individual, collective, and organizational sphere.

Individual competencies

Ruas (2005) highlights that understanding individual competencies has thought currents with different approaches, such as the Anglo-Saxons and the French. According to the author, the Anglo-Saxon experts have a more pragmatic view, while the representatives of the "French School" add elements of sociology and work economy to the understanding of individual competencies. Loufrani-Fedida and Angué (2009) point out that individual competencies are built taking into account knowledge (to know) and practical experience (know-how-to-do and/or know-how-to-act), being grounded by behavior (know-how-to-be). Ruas (2005) defines that individual competence is relating to knowledge, abilities, and attitudes of the individual. Retour emphasizes that "one of the roles of collective competence is the development of new individual competence" (*in* Retour and Krohmer, 2006, p. 150).

Collective competencies

Retour and Krohmer (2006) list as attributes of collective competencies: common referential, shared language, collective memory and the subjective engagement. Retour (2012) states, "if certain collective competencies are shared by the whole company, the result can be the holding one or more strategic competencies or "core competencies". Davenport and Prusak (1998) complement this statement, stressing that the group does not share the same solutions, the individuals involved need to jointly develop new ideas or reinvent their ideas in other ways. Michaux (2009) highlights that it is appropriate to take into account collective competencies analyzing, first, the job situation and the team nature.

Organizational competencies

Borja de Mozota (2003) stresses that the constitution of a core competency in the firm is guided in the development of new knowledge capacities, whether in the individual or the organizational sphere. Prahalad and Hamel (1990), however, argue that the competitive advantage of companies is in the core competencies, and not in their products or services. Avendaño (2005) encourages the development of an integration strategy with the responsibilities of the individual in mind and not the product, for this means that this product is a result rather than the end of this integration.

Levels of competencies and design management

Some authors discuss competencies related to design or design management (Bruce *et al.*, 1999; Borja de Mozota, 2003; Boland and Collopy, 2004). Based on the classification of individual competencies (knowledge, ability, and attitude) proposed by Ruas (2005), it is possible to group together the designer competencies referred by Borja de Mozota (2003). Connected to knowledge, Borja de Mozota (2003) relates technical, concept, scientific, and colors. Tacit knowledge, routines, processes and organizational practices are also related as strongly linked to design professionals, especially in trends research processes and concept development for a product and / or service, for example. Bertola and Teixeira (2003) and Capaldo (2007) relate design knowledge to the occurrence of routines, processes and organizational practices typical of design activities, and difficult to understand by some managers. Concerning abilities, the same authors emphasize creativity, strategic thinking, presentations, and commercial. Boland and Collopy (2004) stresses that design professionals have the ability to create solutions for new possibilities for the future.

Borja de Mozota (2003) also stresses commitment, enthusiasm, self-confidence, results orientation, relationship building, and problem solving related to individual attitudes. Boland and Collopy (2004) emphasize that design professionals have design attitude, while managers have decision attitude. "A decision attitude carries with it a default representation of the problem being faced, whereas a design attitude begins by questioning the way the problem is represented" (Boland and Collopy, 2004, p. 9). The authors add that "a design attitude can bring us path-creating ideas about new ways to use technology, new materials, and new work processes that can change the definitions of cost and efficiency" (Boland and Collopy, 2004, p. 10).

Directly involved in work team processes, Robin *et al.* (2007) list as desirable design competencies the adaptability, communication, coordination, decision-making, interpersonal interaction, and leadership. Belkadi *et al.* (2007) add the importance of a structured construction team project is directly related to management of competencies.

In the organizational scope, Borja de Mozota (2003) views design as a resource and as a core competency or key competency. When treated as a strategic element in organizations, design has to do with the mission, values, and strategic planning, according to the same author. The author also argues that the culture and the organization's actions are connected and in line with the design, aiming to achieve better results for the company. Libânio *et al.* (2016) emphasize, "the understanding of design as a value as well as the design culture in organizations acts and belongs towards work processes and organizational structure upon the occurrence of design management" (Libânio *et al.*, 2016, p. 166).

Research methodology

A systematic literature review (SLR) was developed, seeking to identify possible interrelationships between design management and competencies. Biolchini *et al.*

Table 1. Steps of the systematic literature review (SLR).

Anderson *et al.* (2003)	Alderson *et al.* (2004)	Biolchini *et al.* (2007)	Adapted by the authors
(1) Develop a conceptual framework to organize, group, and select the research; (2) Systematic research, data recovery; (3) Evaluate quality and synthesize the effectiveness of evidence. (4) Summarize information about other evidence (applicability, economy, other effects and barriers to implementation); (5) Identify and summarize the research gaps.	(1) Developed a protocol; (2) Formulate the problem; (3) Find and select studies for review; (4) Evaluate the quality of studies; (5) Collect data; (6) Analyze and present the results; (7) Interpret the results; (8) Improve and update revisions.	(1) Formulate the question; (2) Select sources; (3) Select the studies; (4) Summarize information; (5) Results.	(1) Developing the research question; (2) Selecting the databases to be used; (3) Defining search strategies (parameters, keywords); (4) Performing the search; (5) Selecting the studies found through the established criteria; (6) Tabulating, summarizing, and interpreting and evaluating information found; (7) Presenting conclusions.

Source: Adapted from Anderson *et al.* (2003), Alderson *et al.* (2004), Biolchini *et al.* (2007).

(2007) conceptualize the SLR as a specific scientific methodology that goes beyond a simple overview. From the methodologies proposed by Anderson *et al.* (2003), Alderson *et al.* (2004), and Biolchini *et al.* (2007), as can be seen in Table 1, a systematic sequence of steps was developed.

The first step of the SLR was to develop a research question, which was formatted as follows: "What is the state of the art about design management related to competencies, and which are the possible connections and interrelationships among the topics?" The second step was to select the databases to be used. So, the survey was developed on the *www* using the portals as a database: Science Direct, Web of Knowledge, and Wiley. For the third step, articles that had the words "design management" and "competenc*" were searched. The period used for the search comprised the journal articles published until the end of 2015, to be mapped the state of the art of subject in question. The areas defined were: "business, management and accounting", "decision sciences", "arts and humanities", "design", and "engineering". 1172 articles were found, but only 38 studies were selected. 1134 studies were discarded because the comprehensiveness of meanings of the word design (draw or project). Bibliographies of these studies were analyzed, identifying the existence of another study. In total, 39 articles were selected. This screening was based on reading of title, abstract and keywords. The information was tabulated as follows: article title, year of publication, authors, research centers, journal published, keywords, and a critical summary of each article. A classification of competencies addressed in studies and an identification of aspects related to the competencies were also performed. Thus, the last step allows mapping the current scenario of research on design management related to competencies.

Results

Overview of the articles

Of the 39 articles selected for analysis, 97% treated subjects directly related to competencies. According to Figure 1, we notice a greater concentration of publications

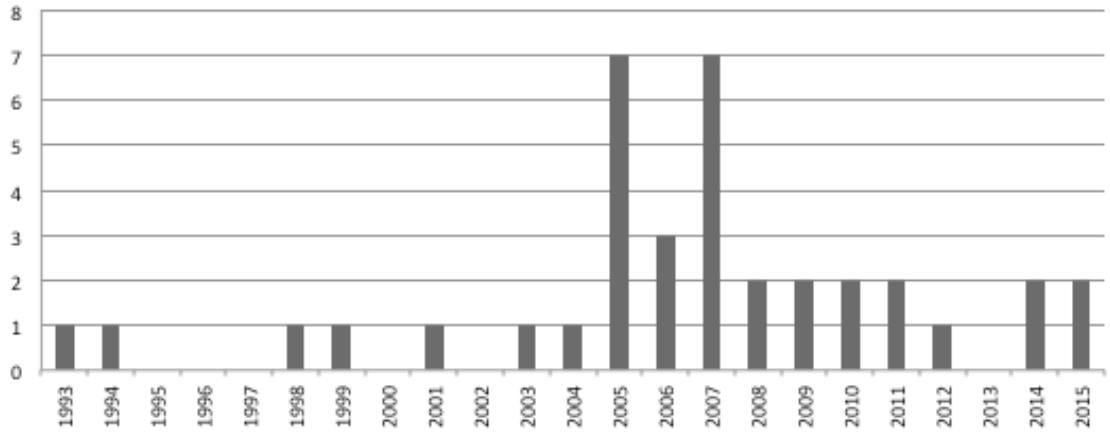

Figure 1. Temporal evolution of publications.

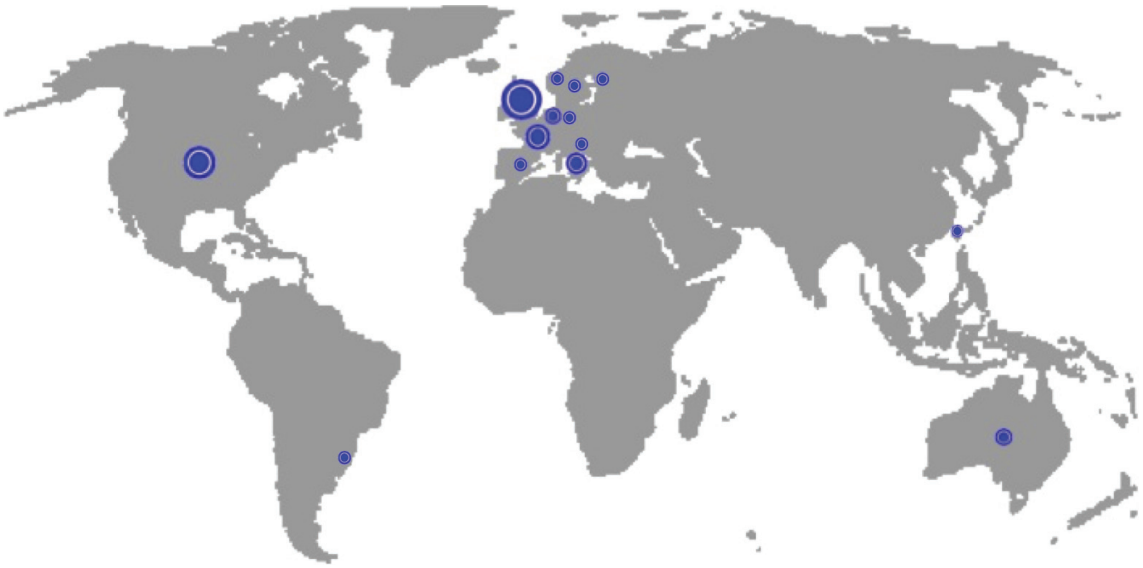

Figure 2. Locations of research centers.

and a consequent interest in research on the theme from 2003 to the present time. Regarding the publication of articles over time, we find a greater focus of publications during the years of 2005 to 2007. This is relevant to the understanding and perception of a possible advance and interest in research in the area in question.

According to Figure 2, the local research centers are concentrated in countries such as: the UK with 10 authors of the articles, followed by the United States, with seven, France with six, and Italy with five authors of publications. With 2 authors each, Australia and the Netherlands are next. Finland, Austria, Germany, Norway, Spain, Sweden, Brazil and Taiwan each register an author per publication. By means of Figure 2, it is possible to map the places of the research centers that invest and are interested in the subject.

A high occurrence of the keywords "design management", "competence", "design process(es)", and "knowledge" is perceived. The journals that received the largest number of articles are: Design Studies (8 articles), Computers in Industry (5 articles), The Journal of Product Innovation Management, and Strategic Management Journal (3 articles each), Technovation and R&D Management (2 publications each), IFAC, IEA, and International Journal of Project Management (1 publication each).

Competencies

The articles found address individual, collective, organizational, central, collaborative, essential, and strategic competencies, as well as characterization, creation, development, classification, management, performance, and allocation of these competencies.

Characterization of the competencies

The combination of internal and external resources and application of competencies in design to manage resources and guide strategic business decisions (Bertola and Teixeira, 2003), are part of the competencies characteristics evidenced in the articles analyzed. Belkadi *et al.* (2007) relate the construction of a project memory oriented through a characterization of the competencies and emphasize that these competencies are supported by a cognitive structure. Studies (Belkadi *et al.*, 2007; Boucher *et al.*, 2007; Osterlund and Loven, 2005) address the classification of the competencies in individual, collective and organizational. Competencies accumulated by the designer, classified as individual, are along the value chain of companies and private domain (Jevnaker, 1993). Proactive profile (Lauche, 2005), creative performance (Belkadi *et al.*, 2007; Lee and Cassidy, 2007), entrepreneurial character (Bertola and Teixeira, 2003; Brown, 2006) expertise of the staff (Olson *et al.,* 2001), skills, attitudes and values of the designers (Ravasi and Lojacono, 2005), strategic and systemic thinking (Brown, 2006), technical and scientific knowledge, cognitive capabilities (Belkadi *et al.*, 2007), tacit and explicit knowledge of individuals (Bertola and Teixeira, 2003; Van Aken, 2005), and competencies in design (Van Aken, 2005; Bonjour and Micaelli, 2010) can be enrolled as individual competencies.

The collective competencies evidenced in the studies analyzed are: structuring, communication, and integration of individuals and work teams (Jevnaker, 1993; Mishra and Shah, 2009), collaboration between team members (Olson *et al.*, 2001; Riel *et al.*, 2010; Robin *et al.*, 2007), construction of networks (Bertola and Teixeira, 2003; Brown, 2006; Capaldo, 2007; Dell'era and Verganti, 2009), combination of internal and external resources (Bertola and Teixeira, 2003; Bruce *et al.*, 1999), sharing of information and knowledge of these teams (Bonjour and Micaelli, 2010; Riel *et al.*, 2010; Robin *et al.*, 2007; Capaldo, 2007; Osterlund and Loven, 2005), and the construction of the project team focused on competency management (Belkadi *et al.*, 2007).

Organizational competencies are associated with: organizational knowledge embedded in routines, processes, and practices (Bertola and Teixeira, 2003; Capaldo, 2007), design understood as a multifunctional activity (Bertola

and Teixeira, 2003) and as a central activity (Ravasi and Lojacono, 2005; Bruce and Morris, 1994), the ability to allocate and coordinate competencies (Boucher *et al.,* 2007), the ability to encode, transfer and deploy tacit knowledge (Subramanian and Venkatraman, 2001), providing management support and feedback on the results available to the teams, good practice (Lauche, 2005) and organizational capacity for design (Mutanen, 2008; Ravasi and Stigliani, 2012), design reflecting corporate values (Olson, *et al.,* 1998) and guiding strategic renewal (Ravasi and Lojacono, 2005), development of the culture of constant learning (Riel *et al.,* 2010), path-creating and resource creating process (Ahuja and Katila, 2004); organizational alliances, creation of value (Capaldo, 2007), structure with good information and an existing culture of common values and terms (Osterlund and Loven, 2005), organizational culture (Brown, 2006; Moultrie *et al.*, 2007), developing internal capabilities of the firm coupled with entrepreneurial orientation (Chaston and Sadler-Smith, 2011), and construction of a project memory oriented by the characterization of the competencies (Belkadi *et al.*, 2007).

Other studies add to the core competencies, relating aspects such as specific context (Bonjour and Micaelli, 2010), design understood as a central resource (Ravasi and Lojacono, 2005; Bruce and Morris, 1994), the integration of all the capabilities of organizations for the production of a core competency in design (Bonjour and Micaelli, 2010).

Articulation of the competencies

Crawford (2005) asserts that competence is not an isolated single construct. Belkadi *et al.* (2007) reinforce that the competencies are activated based on qualitative characteristics of work situations and the construction of these can occur from the review of past projects. Jevnaker (1993) argues that the creation of specific competencies may be linked to the integration of independent designers at the firm. Belkadi *et al.* (2007) emphasize the connections of competencies with knowledge and the situation. Their development is directly related to the organizational learning process (Osterlund and Loven, 2005). Belkadi *et al.* (2007) emphasize the importance of a structured construction of the project team is directly relating to competencies management. According to the authors, these teams must have ability to coordinate competencies throughout business processes (Boucher *et al.*, 2007).

Competencies occurrence frequency in the researched articles

With the analysis of the articles, it can be observed that some competencies are more recurrent and appear in a series of articles. From the identification of these competences, it was possible to classify them at the individual, collective and organizational levels.

According to Figure 3, there is a strong recurrence of the use of the terms sharing knowledge and sharing information, followed by building networks, communication, cooperation and competencies in design. This group of expressions and words denotes the concern with the sharing and the integration of individuals and teams, meeting the affirmations of Jevnaker (1993); Mishra and Shah (2009); Olson *et al.* (2001); Riel *et al.* (2010); Robin *et al.* (2007); Bertola and Teixeira (2003); Brown (2006); Capaldo (2007); Dell"era and Verganti (2009); Bonjour and Micaelli (2010); Osterlund and Loven (2005). We also notice the application and development of design-related competencies (Van Aken, 2005; Bonjour and Micaelli, 2010).

Discussion

Analyses were performed to contribute to a discussion, showing the relationship of the competencies allied to design management for the achievement of a competitive advantage.

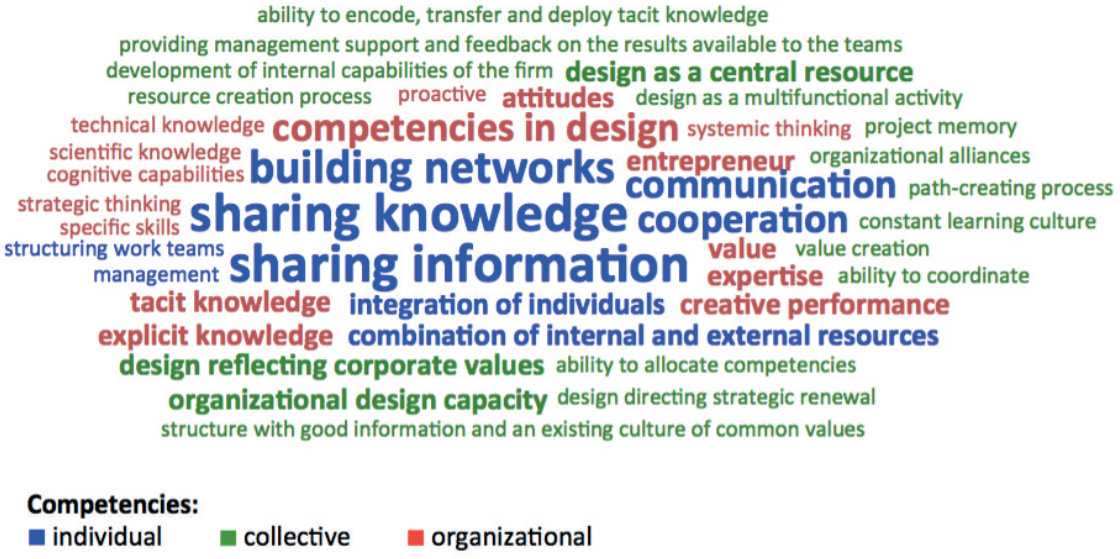

Figure 3. Competencies occurrence frequency in the research papers.

Classification of competencies

With respect to classification of competencies related to organizational structure, some preliminary observations can be made. Osterlund and Loven (2005) highlight the company as an open system consisting of three levels: individual, group or team, and organization. Michaux (2009) highlights that a system is composed by connecting parts, integrating individual, collective and organizational levels, linking the approach of competencies to the systems theory. According to the understanding of the competencies on individual, collective, and organizational levels, these were identified in papers and subdivided as Tables 2, 3, and 4. We suggest a classification of such according to adaptations of the theories of Ruas (2005), Borja de Mozota (2003), and Retour and Krohmer (2006). Ruas (2005) argues that any individual competency is based on a set of capabilities, relating directly to the knowledge, abilities, and attitudes of the individual involved in the process (Table 2).

According to Retour and Krohmer (2006), the attributes of the collective competencies are the common reference, shared language, collective memory, and subjective engagement (Table 3).

Belkadi *et al.* (2007) point out that competencies are activated based on qualitative characteristics of work situations and the construction of such can occur from the review of past projects. Authors emphasize the connections of competencies with knowledge and situation. Work situations can be understood as organizational routines, coupled with the tacit knowledge, can represent unique and firm specific resources. To promote a multidisciplinary activity, individuals, teams, and stakeholders in a company must constantly share information, working in an integrated way (Borja de Mozota, 2003; Best, 2006) and encouraging an environment of collaborative and participatory work. This sharing of actions collaborates to create organizational routines (Michaux, 2009), developing specific knowledge, tracing particular trajectories, encouraging collective learning, and expanding possible collective and organizational competencies in organization.

Regarding the classification of organizational competencies, listed in Table 4, Ruas (2005) lists the basic, selective, and essential competencies, also called core competencies.

Thus, competencies articulate some concepts, such as learning, capacities, value, resources, knowledge, interactions, communication, cooperation, market context, organizational culture, organizational structure, work processes, and stakeholders involved. These concepts, as they relate to the competencies in design management, can assist in structuring and integration of design teams and their contacts.

Table 2. Classification of individual competencies.

	Individual competencies
Knowledge	- Expertise of staff (Olson *et al.*, 2001); - Specific skills (Ravasi and Lojacono, 2005); - Tacit and explicit knowledge of individuals (Bertola and Teixeira, 2003; Van Aken, 2005); - Technical and scientific knowledge, cognitive capabilities (Belkadi *et al.*, 2007); - Specific competencies in design (Van Aken, 2005; Bonjour and Micaelli, 2010).
Abilities	- Creative performance (Lee and Cassidy, 2007; Belkadi *et al.*, 2007); - Strategic and systemic thinking (Brown, 2006).
Attitudes	- Proactive Profile (Lauche, 2005); - Entrepreneurial character (Bertola and Teixeira, 2003; Brown, 2006); - Attitudes, Values (Ravasi and Lojacono, 2005).

Source: Adapted from Ruas (2005) and Borja de Mozota (2003).

Table 3. Classification of collective competencies.

	Collective competencies
Common reference	Structuring, communication, and integration of individuals and work teams (Jevnaker, 1993; Mishra and Shah, 2009).
Shared language	Sharing information and knowledge in these teams (Riel *et al.*, 2010; Bonjour and Micaelli, 2010; Robin *et al.*, 2007; Capaldo, 2007; Osterlund and Loven, 2005).
Collective memory	Building networks (Bertola and Teixeira, 2003; Capaldo, 2007; Brown, 2006; Dell'era and Verganti, 2009).
	Combination of internal and external resources (Bertola and Teixeira, 2003; Bruce *et al.*, 1999).
Subjective engagement	Cooperation between team members (Olson *et al.*, 2001; Riel *et al.*, 2010; Robin *et al.*, 2007).
	Project team construction focused on competency management (Belkadi *et al.*, 2007).

Source: Adapted from Retour and Krohmer (2006).

Table 4. Classification of organizational competencies

Organizational competencies	
Basic competencies	- Structure with good information and an existing culture of common values and terms (Osterlund and Loven, 2005); - Organizational alliances (Capaldo, 2007); - Providing management support and feedback on the results available to the teams, good practice (Lauche, 2005).
	- Building of a project memory oriented by characterization of competencies (Belkadi *et al.*, 2007).
Selective competencies	- Creation of value (Capaldo, 2007); - Ability to allocate and coordinate competencies (Boucher *et al.*, 2007).
	- Organizational design capacity (Mutanen, 2008; Ravasi and Stigliani, 2012); - Development of the culture of constant learning (Riel *et al.*, 2010); - Development of internal capabilities of the firm coupled with entrepreneurial orientation (Chaston and Sadler-Smith, 2011).
Essential competencies (core competencies)	- Design understood as a multifunctional activity (Bertola and Teixeira, 2003); - Ability to encode, transfer and deploy tacit knowledge (Subramaniam and Venkatraman, 2001); - Path-creating and resource creation process (Ahuja and Katila, 2004).
	- Design understood as a central resource (Bruce and Morris, 1994; Ravasi and Lojacono, 2005); - Design reflecting corporate values (Olson *et al.*, 1998); - Design directing strategic renewal (Ravasi and Lojacono, 2005).

Source: Adapted from Ruas (2005).

Connections and links among competencies

By the analysis of the competencies at the individual, collective and organizational levels, possible articulations are perceived, in order to encourage the occurrence of design management in organizations. The sharing of knowledge and information and the integration of people and work teams can be encouraged through communication and routines and work practices established in organizations. Michaux (2009) stresses that knowledge sharing can contribute to the creation of routines. These routines are understood as a work situation, and can represent unique and specific resources of organizations. This idea is in line with Belkadi *et al.* (2007), which reinforces that competencies are activated based on qualitative characteristics of work situations.

Another highlight is the integration of people and teams, sharing knowledge and information, building networks, communicating, and cooperating as a group. This statement reaches all levels of the classification of collective competences, that is, common reference, shared language, collective memory, and subjective engagement.

Competency mapping can also assist in structuring project teams. Belkadi *et al.* (2007) emphasize that there is a project team building based on competency management. Multidisciplinary teams, such as key competencies, can determine the success of a project. At this point, it is essential that there is a design professional involved in the team. This professional holds creative competencies that are determinant in design projects, such as strategically rethinking a portfolio of products and services of the organization, for example. In this way, the classification of individual competences in terms of knowledge, abilities, and attitudes can help when recruiting specific human resources and even building teams for a specific project.

Conclusion

This paper presented a mapping of the current situation of research on competencies in design management, emphasizing possible connections and interrelationships between the themes and other aspects identified. The study provided an overview about the articles analyzed, showing an improvement in publications over time and globally locating research. An analysis about the links between design management and competencies was developed, as well as the identification of concepts related to the competencies that can assist in structuring and integration of design teams and their contacts upon the occurrence and development of design management in companies. It appears that the competencies strongly permeate the concept of design management and that, when articulated, can assist in structuring and integration of design teams and stakeholders involved in design management. The papers selected in this study address essential, individual, collective, organizational, core, collaborative, and strategic competencies, as well as their characterization, creation, development, performance, management, allocation and connections. From the analysis made in the studies collected, we could also conclude that these competencies occur at individual, collective, and organizational levels and that, when articulated to design management, collaborate to achieve a sustainable competitive advantage for organizations.

Based on the totality of information collected, aspects related to the competencies in design management were identified, such as learning, capacities, resources, knowledge, value, interactions, communication, collaboration, market context, organizational culture, organizational structure, work processes and stakeholders involved. These concepts have strong relations between them, enabling connections and probable links with the competencies in design management.

The identification of competencies described in this study make explicit what competencies are necessary to be developed and stimulated for the occurrence of design management in organizations. From the classification of competencies at levels, it is possible to map how and what organizational spheres these competencies should be developed, and what tactics and agents are needed for such action. It is also noticed the relevance of holding certain competences for organizations to develop and implement design management.

The research present the limitation to be applied in specifics databases, so it is not possible to generalize the results and conclusion obtained as a whole. Consequently, it is suggested for future research studies, to expand the range of research in other databases, as well as to apply this classification in specific contexts and organizations. We also suggested to carry out analyzes on possible incidences of cultural and social issues in the countries of research centers related to authors' publications and the mapped competencies.

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