What can we learn from designers who work for large companies?

Research opportunities in design management to enhance the competitiveness of small companies.

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In Brazil, despite widespread recognition of the importance of the design management process, the focus of research in this area is quite recent. Additional research aimed at understanding the situation of Brazilian small companies is particularly timely because there have been many new governmental incentives to help these companies become more innovative and productive. Our article aims at identifying design research opportunities for small companies that can guide the development of further policies and investments of the Brazilian Government, Academia and the small companies themselves. This article was based on data collected in interviews with experts in design. The opportunities identified establish a reference for the conception of a design management framework to be validated in small companies. The proposed framework includes performance of value analysis, innovations in management practices, and new approaches to multidisciplinary team work. The challenge of investigating the applicability of the results of research identified in this article may guide the development of future projects and have implications for changes in policy, both by companies and by the academy.

Key words: Competitiveness, Design Management, Large Companies, Small Companies

1. Introduction

Many studies have been published in the design management area in the last three decades. Most of these projects are directed at large companies that are diversified across different market segments. Some of these academic studies have shown that the way the design management process is conducted in a company can positively influence the result of the design process [19,3,2]. An improved design management process can reinforce the strategic positioning of companies where design is strictly connected with the commercial success of a product. In Brazil, despite the recognition of the importance of the design management process, the development of research in design management is quite recent [17]. Much of the research in Brazil regarding the design management process has been oriented to the improvement of the coordination of the design process itself [1,6,7] or to development of design management models [12,23]. These studies do not indicate if the companies that have implemented their suggestions for improvement are currently more competitive in the Brazilian market. It is perhaps worth mentioning that the lack of research oriented to Brazilian small companies is even more prominent in spite of there having been many governmental incentives to make these companies more innovative and productive.

For the purposes of this article, we use the definition of small, medium and large companies provided by the Brazilian Support Agency to Micro and Small Companies [21]. According to this definition, a micro company has up to 20 employees, a small company has more than 20 employees and less than 100 employees, the number of employees of a medium company ranges from 100 to 499 employees, and a large company has more than 499 employees.

In this research, we investigated large companies since they are more in the center of international competition than small companies. Moreover, small companies also compete with large companies [9] and this situation creates a quest for best practices of the leading companies. Small companies also usually operate in the market under the shadow of large companies [14], and sometimes they follow the lead of large companies, as in the cases related to quality programs [10]. It is also worth mentioning that larger companies have more resources and are often more competitive than small companies (Penrose [16] cited in [5]). These factors suggest that there is some value in investigating opportunities for research to be developed in small companies through data collection in large companies. The results can help guide the development of further policies and investments of the Brazilian Government, Academia and the small companies themselves. This article aims at identifying those opportunities, based on data collected in interviews with experts in design.

2. Research Method

The research started with a literature review in August 2011, and continued with a series of structured interviews with experts that directly work with the development of industrial products. Figure 1 shows the design of the research method. The search for references was carried out by using the following keywords: design management, competitiveness, small companies, and innovation. Definitions and quotations related to the keywords were looked up in the assembled articles and books. After being extracted from the articles and transferred to a chart, the definitions and quotations were codified with new keywords. From this codification, questions to be included in the interview protocol were formulated.

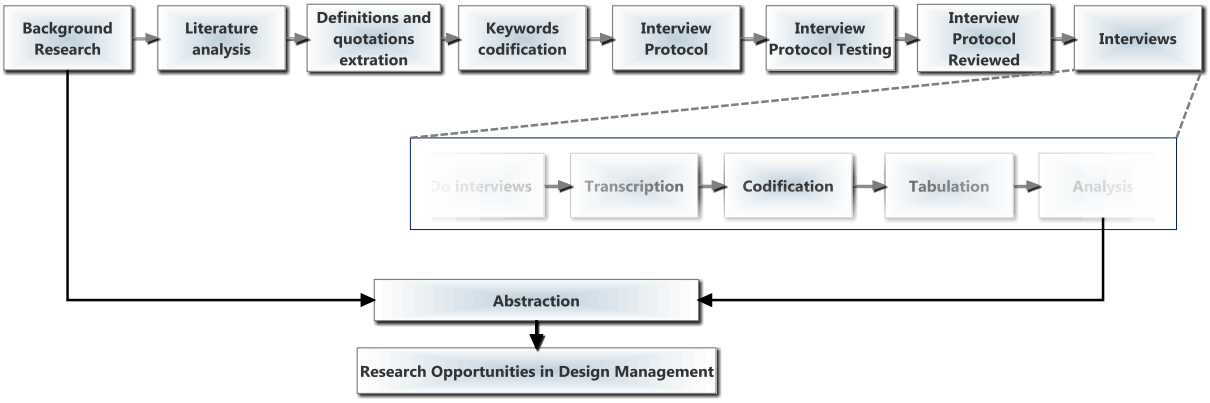

Figure.1 Research Design

The interview protocol is shown in its final version at http://www.ndp.ufrgs.br/interview_protocol.pdf. An additional question was included in the protocol in order to apply the critical incident technique, which aims at gathering information about the solution of practical problems encountered during the product development process [20]. Answers to this question inform competitiveness in that competitiveness is related to innovating processes and products [13], which in turn are directly related to the creation process of the company through the

stages of problem solving [4]. The interview protocol was reviewed following the first interview, in an attempt to assess the understanding of the questions by the respondent and determine the need for either reformulation or addition of questions. No changes were made following the review. The experts we interviewed were chosen regarding their design experience. Table 1 shows the respondents' professional education.

Table 1. Education, previous work and projects, and current work of the interviewees

Interviewee	Education	Previous works and projects	Current work
A	Bachelor in environmental design with a major in industrial design	More than 20 years' experience in design in various different fields, from furniture to electronics	Executive director of an Innovation Center of a University
B	Bachelor in industrial design and master in design planning	Worked as a designer in electronics companies and design firm	Independent consultant and University assistant professor
C	Bachelor in industrial design and master in design	Worked as a designer in the fashion and textile industry, automobile manufacturer, University assistant professor	CEO at a design consultancy company
D	Master in design	Worked as a designer in a design firm and electronic company	Independent consultant and University assistant professor
E	Master in information science	Design firm, electronic company	University assistant professor
F	Bachelor and MID in industrial design	Twenty years' experience in industrial design, working in electronics companies	Design manager of a large American company responsible for the product design and portfolio

The subjects were asked by e-mail to participate in the study, and they were interviewed at their workplace. The interviews lasted one and a half hours, and were recorded to be later transcribed. A company was hired to transcribe the interviews, which were made available within four weekdays at most. Data from the interviews were coded with the use of the NVivo9 System. After codification, the data were analyzed and tabulated to facilitate the identification of the research opportunities in design management. Using the Mandala Browser, we also developed an analysis of the possible connections between the most frequent words identified with NVivo9. The findings were then abstracted in order to make possible the identification of future research opportunities. According to [11], abstraction is important when ideas are obtained through the analyses of different contexts and companies. Successful application of ideas in contexts that are different from those in which they were conceived requires that such ideas are abstracted and reapplied with changes, taking into consideration characteristics that are specific to the application site (Figure 2).

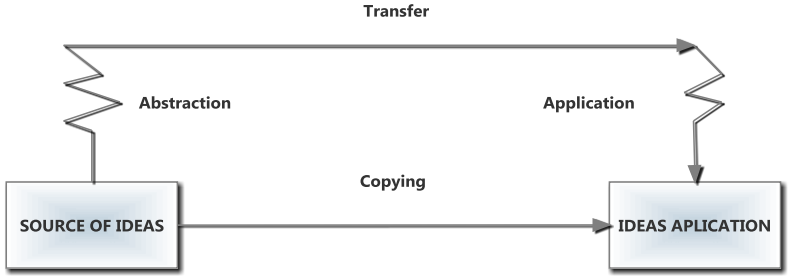

Figure. 2 Abstraction, transference and application of ideas (adapted from Lillrank, 1995).

The content of the interviews was analyzed with the help of the NVivo9 system: nodes were defined in NVivo9 during the reading of the interview transcripts. The nodes can be considered as keywords that represent a certain portion of the interviews. The nodes were defined by the first author of this article according to his own interpretations of the subject under analysis. Therefore, there is some individual bias in this interpretation regarding the reasoning used to define the nodes. However, there has been an attempt to reduce such bias through the discourse on which the definition of the nodes is grounded. This procedure is presented in the next topic of this article. We then tried to study the relationship between nodes through a cluster analysis. The nodes were clustered according to word similarity; the Pearson correlation coefficient was used for the grouping procedure.

3. Findings and Discussion

The most frequent words found in the set of six interviews are presented in a tag cloud in Figure 3, obtained with the use of the NVivo9 system. The tag cloud suggests that the experts have not established a direct relationship between design and management. It is worth commenting that the answers are related to the content of the questions themselves, which attempted to collect evidence for the identification of research opportunities that would favor a better integration of the design process with the management process in product development companies.

It is interesting to point out that the experts are directly involved in the design project development, and some of them even coordinate a design team. Therefore, the answers may be biased, since data obtained have shown a stronger relationship with design activities than with activities related to the management of projects conducted by the experts.

Figure. 3 Tag cloud of data collected from the six interviews

The most recurrent words in Figure 3 were subject to a content evaluation. There was an attempt to keep only nouns and verbs that showed a direct relationship with the design process. The occurrence of the word ‘understand’ can be used as an example. This word was employed by the experts in different ways: when the expert asked the interviewer whether he had understood the answer, and vice-versa, or in situations in which the

word meant ‘comprehension of or attempt to comprehend aspects related to the design process itself’. The content of words chosen for analysis was also filtered, so as to keep only words directly related to the context of this research. For example, the word ‘experience’ has been kept, but a new counting was performed in order to correct its absolute frequency by considering the content related to the design process. Thus, whenever that word meant ‘expert experience’, it was not counted. In this example, we tried to count only words whose meaning was related either to the experience of potential consumers or to the experience of a design team in developing a particular project. Interest in project development has also become apparent from the most mentioned words (Figure 4): design – people – product – project – research. The order of these words suggests a link to the very function of a design project: search for solutions by devising products, systems, communications and services that meet human needs to improve people’s lives [15].

In the context of data collected, the word ‘management’ was the 22nd most mentioned word, not too far from the position of the word ‘business’. As it can be seen in Figure 4, the analysis of the other most frequent words suggests that experts give importance to research addressing the understanding of market problems.

The orientation of the design project development with a weak relationship with management practices was also found through the connections between terms obtained using the Mandala system (Figure 5).

The main objective of this article is related to the search for research opportunities to increase competitiveness of product development companies. In this sense, it is known that one of the ways of competing effectively in a given market is through the development of innovative products or services. Hence, although ‘innovation’ and ‘management’ are not among the most recurrent words (Figure 4), we have attempted to study their connections with the most frequently mentioned words.

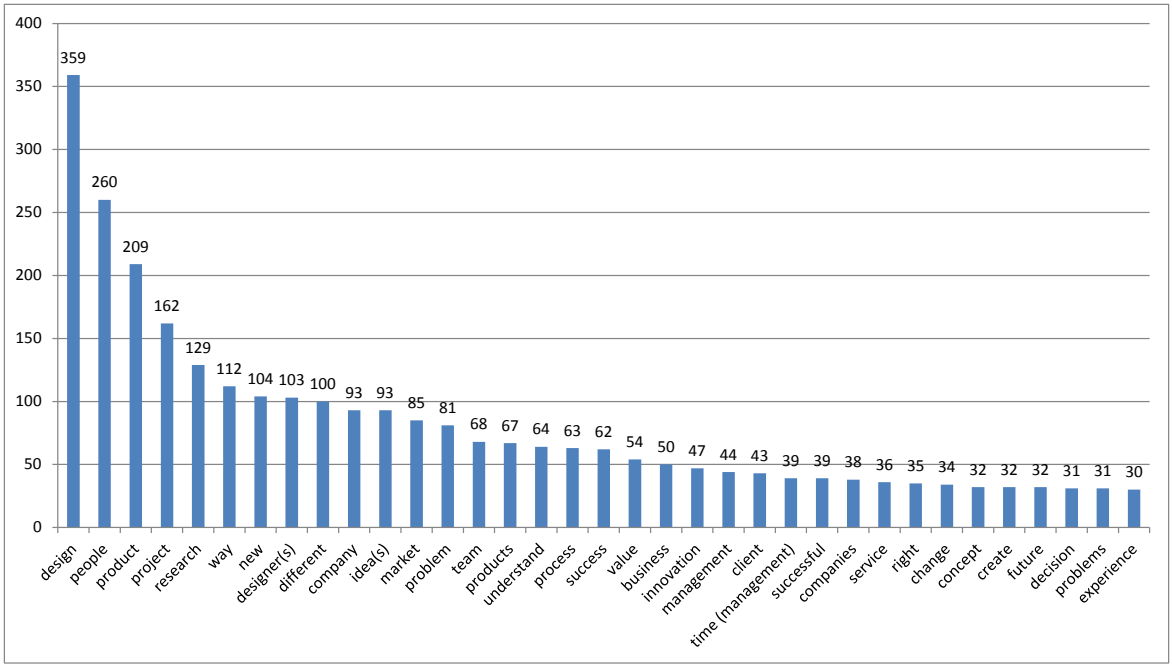

Figure. 4 Thirty-five most recurrent words in the general context of the research

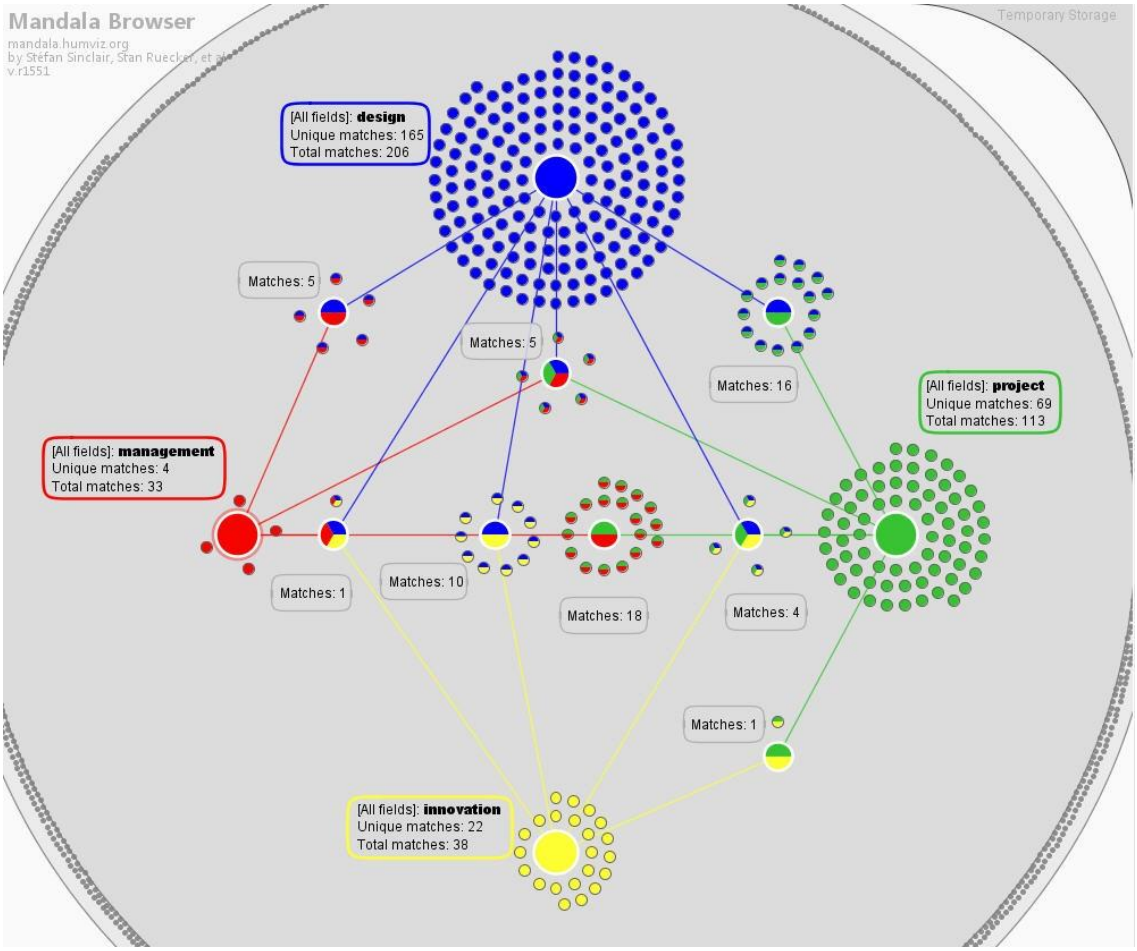

Figure. 5 Connections between the words design – project – innovation – management

The analysis of Figure 5 suggests that there may be a stronger relation between the words 'design' and 'project' (16 connections) than between 'design' and 'management' (5 connections). It is also important to notice that the relationship between the words 'project' and 'management' (18 connections) is stronger than the one existing between 'management' and 'design'. This may be evidence that experts regard design as a process that is conducted separately from project management practices.

Another interesting evidence in Figure 5 is related to the connections between the words 'innovation' and 'design' (10 connections), and between the word 'innovation' and the words 'project' (4 connections) and 'management' (1 connection). The analysis of the latter connection shows the importance of developing a design management process to support the idea and concept generation process.

...so they have made a special website that actually calls general public for ideas because nowadays you never know who has a great idea for innovation. It's not, as I said – it's not necessary. It may not be any technological invention so sometimes known expert or the expert from totally different field may have some idea for the industry that they have never thought of, so that's what's happening now. The knowledge and wisdoms are scattered all around the world, and you never know who has a great idea, so that design management now is to how to not to overlook the ideas people may have and how to kind of pick up or collect any kind of smaller ideas that may become big ideas as it combined with some expertise or some technologies that their company has

because sometimes they don't realize how to use their technologies, and you never know who has the idea for that. – Designer C

By analyzing the previous connections excluding the word 'management' and including the words 'research' and 'people', which are among the most frequent ones in the context of this paper (Figure 4), it is possible to notice 36 connections between the words 'design' and 'people'; 21 connections between 'design' and 'research'; and 17 connection between ' project' and 'people' (Figure 6). However, the number of connections between 'project' and 'design' is lower (14 connections), as well as between 'project' and 'research' (9 connections). Data presented in Figure 5 suggest that the word 'design' was used by the respondents in general with comparatively few links to the word 'project'. This may suggest that the respondents attributed more importance to the word 'design' than to the word 'project'. The word 'project' can be defined as 'a temporary endeavor undertaken to create a unique product or service" [18]. In the context of a product or service development company, the word 'project' is related to activities required for the delivery of a certain product or service, through the accomplishment of processes related to the management of scope, time, cost, risk, people, and communications, among others.

In Figure 6, the word 'design' can be understood in this context as the act of creation or conception that will make possible the delivery of a product or service in a certain moment. In this sense, the word 'project' is more comprehensive than the word 'design', since it involves both the design process and processes related to financial issues, risk, contracts and acquisitions, which are not under the responsibility of the design team.

It is possible to notice, from the analysis of Figure 6, that there are more connections between the words 'design', 'people' and 'research' (12 connections) than between the words 'design', 'people' and 'innovation' (2 connections). Only one connection establishes a direct relationship between 'design', 'people' and 'innovation' in conjunction with the word 'research'. This evidence suggests the respondents' stronger orientation towards the research process itself. In examining these portions of the interviews, it is clear that the design research process is mentioned as a means for the creation of innovative products. This evidence also refers to a natural order of the experts' cognitive process. For them, innovative products do not appear by chance; the conception of such products stems from both the analysis and the synthesis of the design research process.

So I'm much more about trying to understand how to create real value for people. So, you know, the iPhone's a great example of that class of smartphones that enabled people to connect to the internet and solve problems every day with instant availability of information. To me, that's a real innovation and that's a real serious purpose of design research is to get understanding on how to do that. – Designer B

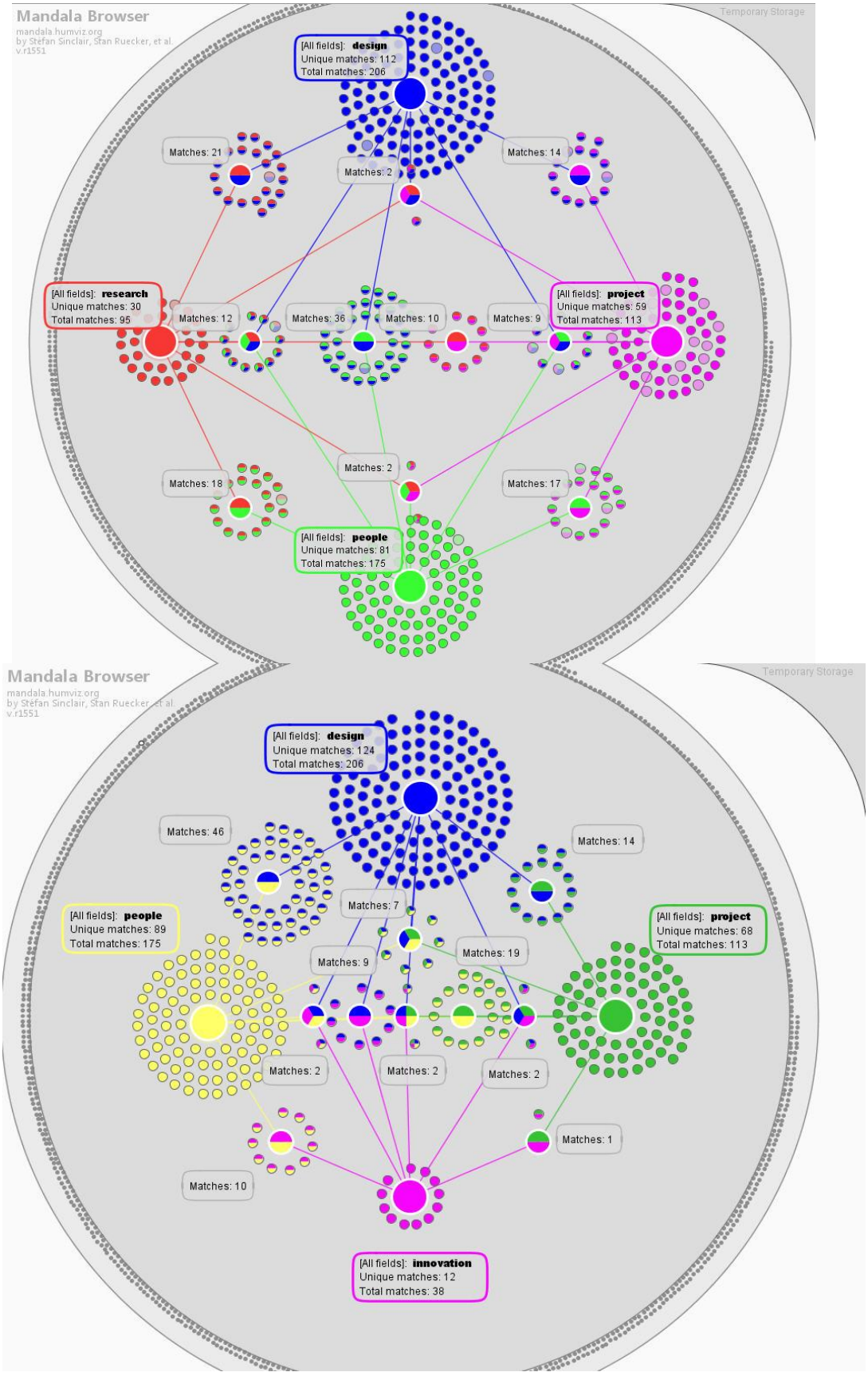

Figure. 6 Connections between the words design – project – research – people – innovation

4. Analysis of node clustering

After defining the nodes that would be used in the research, we developed the analysis of node clustering (Figure 7). The analysis showed that there is similarity between the words mentioned in the nodes ‘Analysis and Synthesis Process’, ‘Flow of Information’ and ‘Readiness for the Market’. However, there is more proximity between the nodes ‘Flow of Information’ and ‘Readiness for the Market’.

And another is a decision-making part, so even if you think about it’s a great concept what usually happen is, oh, okay, that’s an interesting concept, but why don’t you wait until we collect enough data for the validity of the marketing and then your competitor do the same thing much earlier, much faster than you, and you will lose the opportunity, so the decision-maker has to understand the validity of the ideas without having backup data or the – some validation of the concept in statistical way. – Designer C

The content of these nodes explains the reason for such a cluster. In this case, the flow of information was related to the company size. In small companies, information flows more rapidly than in large ones. That is the reason why decisions are also made more rapidly. This suggests that, in situations in which the flow of information is more efficient, there may be a tendency towards a more efficient decision-making. In general, the number of hierarchic levels in a small company is smaller than in a big company; in some cases, they do not even exist. The ways in which the analysis and synthesis processes are developed are also similar to the flow of information. From the evidence we collected, regardless of the company size, these processes are developed through an intense flow of information, with close cooperation from the multidisciplinary design team.

There is also a cluster of the nodes ‘Milestone Definition’, ‘User-Centered Research’ and ‘Design Research’. The proximity between ‘User-Centered Research’ and ‘Design Research’ is explained by the fact that the experts focus on the need for research that involves collecting user data. In this context, it is important to define milestones for the multidisciplinary team members to be aware of deadlines that the group established for the accomplishment of tasks by each individual.

Data concerning the nodes ‘Indicators’ and ‘Multidisciplinary Team’ suggest that, due to the diffuse logic involved in conducting the design process, it is not very easy to define indicators for the management of the design process itself.

I don't think you can. I mean I think marketing has the same issue. How do you evaluate the effectiveness of an advertising campaign? You can look at sales, and that's usually what's done, right? That's – is it a successful product? Well, what we did, our part, we were part of the recipe that made that happen, so it was more effective. But it usually is kind of relative. It's like, "Is this program better than the other one we did? Better than the one previous?" That seems to be more realistic. To put just a pure objective measure on it, it's very difficult. I don't know if you can. It well-designed products, I don't know if you can separate the design from the production or separated from the service or separated from the advertising, because it's all together. That's, again, what people are buying. They're not buying design. They're buying the whole package. – Designer D

However, there is evidence that the design team, in general, may use market indicators to assess how the product to be developed is supposed to compete in the market. In this case, it has been noticed that the experts' experience is more related to indicators of results than to indicators of process. In this sense, there seems to be a barrier in the modus operandi of the design team, thus impeding more proximity to indicators of the performance of the design process itself. This is likely to show a displacement between the management practices applied to company management and those employed for the development of the design process itself.

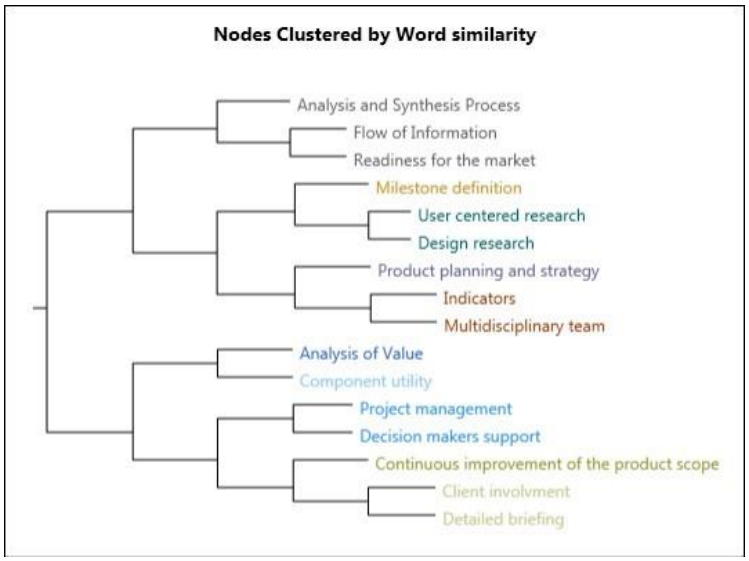

Figure. 7 Dendrogram showing relationships between the nodes identified from the interviews

A cluster of the nodes 'Analysis of Value' and 'Component Utility' has been also found. This suggests that the product components may be chosen through value analysis.

[*some things] I guess, are, in that sense, less important, but still to get to the competitive product in the end, every single thing is important, like if you look, again, using an Apple product, for an example. Every single thing about it is very, very carefully worked out, from the packaging to the graphics to the advertisement to – there's nothing that – they think everything is critical to success, which probably is.* - Designer A

Regarding the cluster of the nodes 'Project Management' and 'Decision-Makers Support', data suggest that if the project management process is conducted by people that have experience in the design field, a higher commitment to the project by decision-makers can be expected.

The cluster related to the nodes 'Client Involvement' and 'Detailed Briefing' suggests that understanding and detailing what is going to be developed may facilitate the identification of the stages of the design process in which the client must be involved (in the case of external design). The grouping of the latter with the node 'Continuous Improvement of the Product Scope' is related to the need for enhancing the product concept throughout the process. This evidence suggests that a better briefing may organically lead to incremental improvements to the product scope.

5. Conclusions

The research opportunities identified are more related to the improvement of the design process than to the management of the process itself. Considering the presupposition that the answers to interviews are directed to activities that are part of the respondents' routine, a complete lack of use or little use of traditional management processes throughout the design process have become evident. It is worth highlighting that our expert interviewees work directly with the development of innovative products that have been acknowledged in the global market. Their success might suggest that they have paid more attention to management practices for conducting the project, but this does not seem to be the case. Although data collected have allowed for the identification of the necessity of managing the design process, there has been no consensus related to the application of a particular management method, tool or technique. Practices acknowledged as efficacious in the scenario of project management have been interpreted as inefficient in the design process. This indicates that the diffuse logic of the design process require different management formats. A possible justification for this evidence is found in [22], who argues that designers have not been trained in essential management foundations in undergraduate courses. [8] have also criticized the understanding of the world through only one discipline, as this could hinder the development of a trans-disciplinary mindset.

From the evidence found in our interviews, it is possible to infer that design should be managed, and the person in charge of its coordination should have knowledge, experience and skills in the design field. Even though the occurrence of literal descriptions of the term 'design management' has not been significant, there is a strong relationship between the design management process and the research opportunities identified. Such opportunities refer, for instance, to the performance of value analysis, project management and multidisciplinary team work, among others. In other words, they are linked to management practices. The latter are related to 'how' to have successful products in a given market. Finally, the opportunities identified establish a reference for the conception of a design management framework to be validated in small companies. The very challenge of investigating the applicability of the results of research identified in this article may guide the development of future projects and foment changes to policies, both by companies and by the academy.

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