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An online survey's design to capture Portuguese companies' perspective of Design

Abstract

This study focuses the construction of a survey that aims to capture the Portuguese Manufacturing Companies' perspective of Design, its sustainable use and strategic impacts, within a group of more than 42,000 companies. It is included in a project with the title "Design as a company's strategic resource: a study of the impacts of Design" that is funded by Science and Technology Foundation (FCT) for the next three years. It is developed by a multidisciplinary group of researchers from several scientific areas such as: design, economics, management, marketing, engineering and artificial intelligence. The project in its exploratory research stage comprises the development of three field studies about Portuguese Manufacturing Companies. Surveying this sector is the first study that seeks to define rigorously the reality of this group. The design of this survey is critical regarding the whole project work; therefore a pilot survey was designed and launched being the data collected treated so it would be possible to test both the method and the survey's contents. The option for an online survey is supported by several arguments being the two most relevant: the possibility to use complex question skipping logic and other features not possible with other methods along with the chance to combine survey answers with pre-existing information about the companies. These functionalities are expected to ensure a definition of a reliable questioning structure to support critical information's acquisition from the target audience being adequate for comparing data from a broad spectrum of companies. The approach to survey's contents construction is also crucial and comprises two main tasks: a) the selection and description of questions oriented to the construction of a framework that will try to frame the sustainable use of Design in companies; b) the development of a hidden structure that anticipates problems of reliability, non answering effects and bias upon results. In view of that the system presents an 'anticipation mechanism' that comprises a 'structure maintenance system' and a 'reason maintenance system'. The remaining bias effects that can arise will be corrected through the analysis of companies' interviews and in-field experimental experiences. There are two distinct contributions of this work: a) an effective one that results from the pilot survey action, that will have a direct effect on the survey and b) the expected contribution of survey's results to the field of Design education as a catalyses for new ways to discuss and analyze the theme particularly in respect to the Portuguese Manufacturing Company's assumption and use of Design. This knowledge can be use to frame and refine some of the Design courses contents achieving to a better match between Design education and industries as Design strategic users. Finally this study also advances Design research as a privileged resource that links education to economical agents.

Key Words: *Design online survey; Survey structure; Design use evaluation; Design strategic impacts*

Introduction

The present study seeks to make a diagnosis of design's assumptions and use in the Portuguese Manufacturing Companies. To do so it is needed to gather critical information both quantitative and qualitative. We are aware that all the methods present advantages and disadvantages. In fact we will use three of them in different stages of the research by the following order: surveys, interviews and observations. This sequence is justified by: a) a background subject knowledge from our partner, Portuguese Design Center (CPD), and some team researchers that developed consulting services in the area of design to some of the manufacturing companies; b) a focus logic towards specific information in the design field that somehow validates using surveys at first in order to gather primary information.

The option was based upon the analysis of the following table that presents an assessment between a phone interview approach, a self administered survey and an electronic administered one.

Characteristics	Phone Interview	Self-administered	Electronic administered
Maintained degree of control (Control over the use of the questionnaire on the part of the client)	High	Low	High
Obstruction/Impact (level of attention required and intrusion in the activities of the surveyed individual)	Moderate	Low	Low to Moderate
Rate of cooperation	High	Low	Moderate
Field work duration	Short	Long	Moderate
Cost	Moderate to High	Low	Moderate
Complexity of supported questions	Medium	Low	High
Easiness to interrupt the answer	Moderate	Easy	Easy to Moderate
Possibility to gather data by observation	No	No	Some
Minimization of order effect (it permits the control of questions ordering effects)	Yes	No	Yes
Complex filters allowance	Moderate to High Complexity	Low Complexity	High Complexity
Possibility of using specific terms or client language	Yes	Not Easy	Yes
Bias provoked by interviewer	Moderate to High	Low	Low
Level of control on interviews supervising	Good	Non existent	Non existent
Answer quality	Good	Weak	Moderate to Good
Interview time limit	Moderate	Short	Moderate to Long
Easy to support geographic dispersion	Moderate to High	High	High

Table 1 - Three Types of Interviews (Adapted from Coelho & Vilares, 2005: 105)

The choice of the online survey against the other two methods was supported by the following reflections: the target audience is familiarized with electronic medium. This can be sustained by the results of a survey made in 2006 by Industrial Portuguese Association (AIP) that stated that 94% of the companies are internet connected and that number is higher if we restrict the analysis to the medium of large companies where the percentage is of 98%.

The option for an online survey, as Couper (2000: 464-494) observed, grant us a few noticeable advantages over other surveying techniques such as: major speed, less cost, and high flexibility. In addition, it is adequate to our sampling option because through a software selection we restrict the groups we want to study using this technique.

Besides the appointed advantages there are others that are critical to the reinforcement of reliability of our study, such as:

- Time to processing collected data
- Online questionnaires can use complex question skipping logic, randomizations and other features not possible with paper questionnaires or most email surveys. These features can assure better data.
- A significant number of people will give more honest answers to questions about sensitive topics, when giving their answers to a computer instead of to a person or on paper.
- The possibility to develop as Potter (1992:35-39) suggested a survey system that will combine survey answers with pre-existing information about the companies.
- The method is low demanding in terms of subject's availability schedule.
- The system can incorporate answer quality control mechanisms in real time basis that is usually achieved by protocol methods.

There are also some disadvantages of this method that we should be aware off and try to diminish in this research such as:

- People can quit in the middle of a questionnaire. They are not as likely to complete a long questionnaire on the Internet as they would be if talking with a good interviewer.
- We can not be 100% sure that the survey will be responded by the addressed person.

- The inquired person must have the ability to use computers easily. Though, the rate of response can be influenced by subject experience in the use of information technologies.(Grandcolas & Rettie, 2003: 5)

In the following text we describe early statements, and then a replication made to the pilot survey and in the end is introduced critic ideas to make proper arrangements towards a final survey.

The survey

The main goal of this survey is to capture data regarding design constructs of manufacture industry people perceptions, along with other two methods. Therefore we drew some standard ideas. However we understood the task was hard and complex to carry out though, an introduction of a pilot survey seems adequate to prevent large mistakes.

Issues addressed by the survey

The issues that will be addressed by this national online survey (that gathers information related to activity during the three years 2003 to 2006), are: a) Design's company's definitions; b) the Design's role in the business, (actual and desired); c) the Design's use in the company, (actual and aspired).

The survey's target audience – a brief statistical portrait

Our target audience is the Portuguese Manufacturing Companies. Its characterization was made based upon the confrontation of data gathered from AIP (Industrial Portuguese Association), AEP (Portuguese Contractor's Association), IAPMEI (Institute to Support Small and Medium Companies) – as well as the data and data analysis produced by INE (Statistics Portugal).

The Portuguese Manufacturing Companies represents 14.4% of the universe of Portuguese companies, i.e. 43.490 companies (IAPMEI: 2007). As it happens in the universe of industry as a whole, where 96% of the companies are small and medium ones, in the manufacturing sector the percentage is 99%.

Similarly with other industries, the companies are mainly concentrated in three geographical areas North, Center and Lisbon defined by Statistical Territory Units Nomenclature (NUTS II) that together represent 89% of the manufacturing Portuguese universe.(INE:2006)

This industry includes sectors such as: Textile and Leather; Clothing; Wood, Cork and Furniture; Rubber and Plastics; Non metallic minerals; Metallurgy and metallic products; Machines and electrical and non-electrical equipment; Transportation equipment; Transforming industry and others. The diversity of business of these different sectors implies the obligation of treating information taking into account analysis by each sector.

Sample Selection

The selection of the sample is a critical part of this research task because it must be representative of the Portuguese Manufacturing Industry as a whole. Fortunately we have as a research's project partner CPD that has a company's database we can access that is representative of all manufacturing companies that use design. This will promise a good response rate given the existing contacts of the CPD upon which we could build. It is also expected that these firms be more "Design-conscious" than the average.

But although CPD provides us a good way of sampling firms that use design our aim is to study the Portuguese manufacturing industry as a whole and that includes companies that are absent from CPD's database. For that purpose we have to use the influence and information from AIP, AEP, IAPMEI as well as the data and data analysis produced by INE in order to select firms randomly from those databases and also to promote the participation of associated company's.

The sectors included in this study are those considered in the target audience portrait.

All the Portuguese regions will be surveyed using the NUTS II classification – North; Centre; Lisbon; Alentejo; Algarve; Azores; Madeira.

Companies will be divided according to its dimension (employment volume) resulting in four groups taking into account the European Community (EC) definition as followed: micro (less than 10 employees; business volume= 2 Millions of euros); small (less than 50 employees; business volume =

10 millions of euros); medium (less than 250 employees; business volume = 50 Millions of euros); Large (over 250 employees; business volume: 50 Millions of euros)

We will also have another 'filter' concerning exportations and non exportations and the weigh of exportation in terms of sales volume. From Design Innovation Group (DIG) studies e.g. Robin Roy (1994:9-17) that surveyed and monitored Britain manufacturing industries from the main sectors during 3 years 1987-1990, allowing a sector-by-sector analysis, we retained that a sample greater than 200 is needed to obviate the problem of having questions that likely produce small samples.

As Grandcolas & Rettie (2003:4) claim the validation and representativeness of the sample will be much more endangered by sampling plan than by the way it is worked/used. That means that as Gilbert Churchill (1999) noted the non coverage error is directly associated with sound database's quality without undervaluing the non answering problem. These two examples of possible error implicit in the sampling process can occur in all the surveying methods. Another type of errors such as a weak problem's framing, or inadequacy of methods or human resources involved in the data's validation and control must also be prevented.

Making an online survey seemed more effective in order to deal with this information but because there was less experience to use it, we decided to build a pilot test to accomplish two ideas: a) replicate traditional survey under this new medium and; b) explore new features brought by the medium.

The online Pilot survey

One of the advantages of this method in the words of Perrot (1997:3) is that all the process is automatic, from fulfillment until data is transferred to be analyzed. As Frost (1998:472) states this functional characteristic, besides the fact that ensures data integrity, it also eliminates data intermediary treatment as well as traditional survey's errors. This online pilot survey served the purpose of testing the questionnaire design in terms of: a) clearness and correctness of the questions, scaling options, choices relevance, etc; b) sufficiency of the questions in what concerns the rigor and richness of information we aim to collect; c) adequacy and depth of comprehension of the terms used – which is related with the consensual perception of the concepts such as: design, strategy, innovation, research, etc..

Structuring the online survey

Due to the characteristics of this digital environment the structure of the online survey presents two major divisions: the visible structure and the hidden structure. The first one refers to the division of the questionnaire into five parts that as a whole contribute to characterize the issues addressed. The second has to do with the development of a mechanism that aims to reduce bias upon results. This feature might anticipate data quality.

The visible structure

Characterization of the Company

The characterization of the company supports the gathering of information such as: company's sector; dimension of the company; company's geographic markets; type of customers.

Definition of Design, Design's role assumption and Design use in general

This section of the online survey tries to capture attitudinal information with respect to design definition and design's role and use. Design conception in the company determines how the company perceives the possibilities design can offer and, that information is critical to the construction of a new reality for design in Portuguese Manufacturing Companies.

Definition of Design drivers

This section addresses the companies' reasons why design use can be profitable in different strategic situations. According to Designium study (2005:25) the factors supporting design use in a company are: competitor's design use; customer's expectations of well-designed products; strengthening corporate image; insufficiency of technology as a competitive factor; design-oriented corporate culture; internationalization of the markets.

There are four types of drivers that can be identified in the companies. They are:

- The Internal Company drivers – the size of the company and the existence of a corporate culture affect Design use by the companies.

- The Industry drivers – that focus on the basic characteristics of the industry that companies operating in: maturity, velocity; product type; standards, legislation that tend to influence attitudes towards design use. According to Designium study (2005:28) , the most important drivers for design use seem to be maturity and velocity of the industry that the company is operating in (e.g. in mature markets, design provides one of the main competitive edges);
- The Customers drivers – that are related with customer type (consumer vs. professional buyer); market diversity (different segments that the company services and cultural differences); share of new customers. Designium study (2005:28) indicates that the most important drivers for design use seem to be also the customer segment (e.g. the varied needs of the different segments that the company serves and to what extent the customer values design issues). This information must be compared with our results.
- The Competition drivers – that have to do with the structure of competition and the potential competitors and substitutes.

Identification of Design enablers

Thomas Walton (2003:99) defines the term 'Enabler' as "something with suitable power, means, opportunity and authority to achieve a specific result of action". Assuming this definition the design enablers characterize the companies' design use. It is about indicators that, as defined in the Designium study (2005:9) "must highlight issues that companies should consider when implementing Design strategies and organizing Design use". Enablers are categorized into three parts: design in vision and strategic development (further categorized into corporate and business unit levels), design management; and operative design use. Company's characteristics and factors in business environment – affect the organization of design in the same way as they affect the content of design strategies. The Designium study (2005:30) showed that strategic design use is engaged in corporate level strategic decisions, such as which product portfolios to expand, which technologies to invest in, and which new markets to pursue.

Identification of Design results and its measurement

The "Design Results" includes external results such as customer results and financial results as well as internal process results. Therefore result indicator concern the accomplishment of strategic goals within the company.

The hidden structure – controlling the process

To prevent problems of statistical significance upon certain key questions and refine reliability of results we developed a survey's process control system, presented in Figure 1, which is structured upon four central ideas:

- A mix of what Thomas Hinrichs (1992:117) defines as Top-Down strategy (A "(...) process tends to be controlled by a Top-Down ("(...) when it is driven by the constraints and structure of the problem") and Bottom-Up ("when it is driven by the task and expectations of the problem solver (...)") strategic approaches to survey's process will contribute to a better control of the results;
- Anticipating survey's fulfillment problems such as uneven responses, contradiction between answers, internal inconsistency of overall survey's response will reduce bias upon results;
- People sometimes answer questions not based upon real facts and/or situations but upon "ideal" or aspired ones;
- Firms with inconsistent answers must be identified being their data recorded as part of a critical memory structure that will serve to address the full range of goals in this research by means of other method such as interviews; (Postponed decision until more information is available).

The questions will be displayed one by one in order to have respondents focused on this single task. With this procedure we avoid an overall survey's judgment and a conscious or even unconscious predisposition to choose which questions to answer and in what terms. To accomplish the goal of reducing bias upon results the 'anticipation mechanism' (that depends upon a memory structure that frames the universe of possible answers) includes a 'structure maintenance system', to ensure consistency of information as well as a 'reason maintenance system', which maintains for and against decisions about answers and records the consequences of the options.

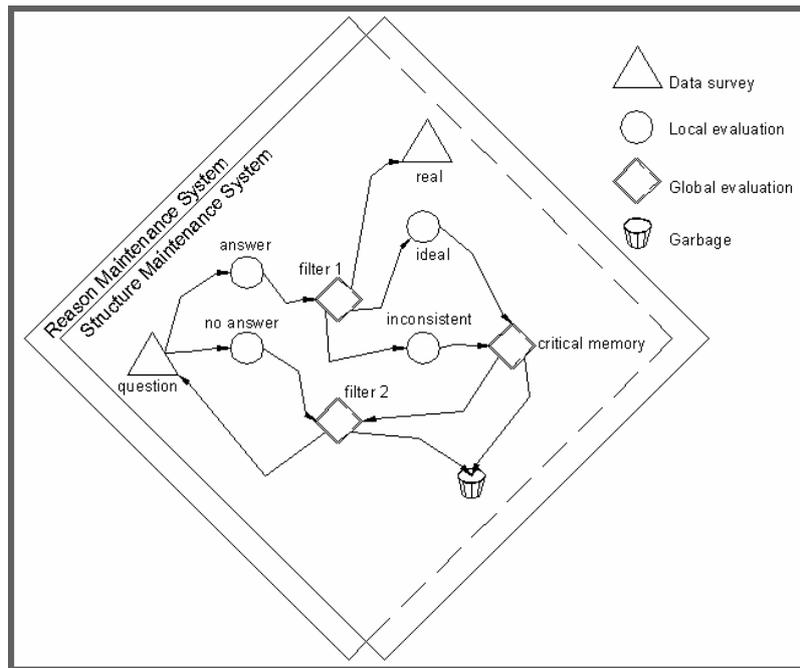


Figure 1 – Hidden Structure - anticipation mechanism scheme

The system also contains four other important elements: filter 1 – that defines the nature of the answer; filter 2 – that reformulates the question, a critical memory – that works as a decision center that temporizes both the introduction of the questions or its garbage disposal and finally, the garbage – that collects the data refused by the system but that will be recycled in subsequent research moments such as the interviews.

The process

The first phase of this research task was the selection of a sample.

In this case we had no need to define a representative sample of the Portuguese Manufacturing Industry as a whole because our goal was not the validation of the survey's content. That will be addressed in the national online survey that will be launched at the end of 2007 year.

In this context and after a previous study of the universe of the Portuguese Manufacturing Industry we decided to select fifty eight companies based upon the following aspects:

- Coherence and alignment with the national online survey sample criteria;
 - the nine manufacturing sectors should be represented in a direct proportional percentage in respect to the universe,
 - the majority of the firms must belong to the small and medium dimension's categories as it happens in the universe where they account for 99% of the billing,
 - The selected companies should be chosen having in mind the geographic importance of the three NUTSII regions (North, Center and Lisbon) where are located 89% of manufacturing companies.
- Existent time constraints (one and a half months to produce material, launch and collect data and obtain information) that implied choices based upon the easiness to obtain a fast collaboration through privileged personal or partners access to manufacturing firms;
- Necessity to gather information in advance both from firms that had never been studied in terms of design's use and others that we already have information in that domain.

The companies were identified, a database was constructed and the privileged contacts of our partners and research members were activated.

The second step of this study was the construction of the online pilot survey.

For that purpose, a paper questionnaire organized in five sections was designed presenting the group of 42 questions previewed for the national online survey. Simultaneously, it was also developed a

document (we named silent survey) that listed all those questions, the reasons that underlie its pertinence in terms of the research project scope, the links (relations) between questions, and its contribution to the reinforcement or denial of a 'coherent speech about design' from the part of the companies. It also contained an identification of key questions concerning the 'reason maintenance system' and the 'anticipation mechanism' presented in Figure 1.

In addition to that a research was made in terms of online survey's layout 'best practices' with the purpose of establish the principles that would rule our online tool. Several fonts and colors were tested; the length of the phrases was adjusted in order to diminish the fatigue of repeatedly going left to right through a very long line (considering the extension of the survey), the text location and its weigh in the composition space was pondered so it would facilitate overall comprehension; an hierarchical formal structure was established to promote the correct identification and setting of questions and choices, sections of the survey etc.

Besides the five sections devoted to questions we found indispensable to include others such as an 'entrance page' to access to survey where username and password were required; it was also designed an 'introduction' page to present the survey, its importance, and to ensure data protection to respondents; a page at the end of the fifth section for the 'submission' of the survey and also an 'help' page that contained a link to an emailing 'suggestions and comments' option.

The system was programmed to automatically email all the company's respondents. An initial email with a message presenting the study to be made was sent; after a week a second email was forward displaying the user name and password to access the survey as well as other general information and instructions related with it. Finally, three days before the end of the time the survey was online and accessible (for a period of 15 days) a third email was sent to encourage participant companies to fill the survey before its deadline date.

The e-mail's messages contained a pedagogical approach in an attempt to strongest the relationship between the inquirer and the respondent. Therefore it was provided our definition of design scope.

During the online time of the survey it was possible to monitor on real time which companies had submitted their surveys, those that have not completed the survey and those that left it blank.

The collected data was automatically transferred to a worksheet, according to a statistical structure compatible with the software, SPSS, to be used in its treatment.

Result's analysis of the online pilot survey

The number of inquired companies was not enough to allow convincing conclusions therefore they were assessed to anticipate the future survey.

We did not obtain data from one sector: the non metallic minerals.

The 18.6% rate of response to the online pilot survey is similar to the values obtained in several comparable surveys such as the survey launched by the Designium study (19.6%). We can also consider the response rate of CIS4 Pilot Survey (UK Innovation Survey) prepared by the Centre for Business Research from Cambridge University, on the 17th June of 2004, that was 16%. This survey was carried out making clear that it was only a pilot and the authors suggest that this may have affected the response rate.

There were 5% of uncompleted surveys and several unanswered questions.

The electronic nature of this pilot survey made us aware of several problems that can arise and that must be eliminated such as: there is always a residual possibility of some of the respondents operates with a software system that does not decode correctly the messages sent; the chance of a breakdown of the server that hosts the survey;

In terms of contents there are a few interesting facts to attend to, such as:

- Regarding the possible associations to be made with design (from strongest to weakest one) we found numbers that show clearly that the attributes related with image prevail. On the other hand the associations with research and sustainability are weakest as well as those with 'giving form' and 'product development';
- Regarding the possible associations to be made with design (from strongest to weakest one) we found numbers that presented clearly that the attributes related with image prevail. On the

other hand the associations with 'research' and 'sustainability' are weakest as well as those with 'giving form' and 'product development'. The 'innovation' concept is the second association companies made; on the contrary 'research' is at the end of the ranking what might suggest that the concepts have different degrees of dissemination and comprehension;

- 55% of the respondents states that understands the place of design in business planning and the way it can be used to communicate the goals of each of the company's functional areas. These are also the companies that are most committed with design management;
- In spite managers recognition of the importance of design in business that does not appear reflected in the investment made in terms of R&D budget. Actually in the majority of the cases the investment is less than 10%;
- Near 50% of the companies state that use design for more than 10 years and the remaining for less than that.

Conclusions

The resultant rate of response reinforces the need of a campaign of dissemination of the research project and its needs near the sector associations so they can act as data gathering facilitators. That is already being prepared so it will precede the national online survey launch.

The analysis of the contents gathered by the pilot survey gave us clues that confirmed the need to use an anticipation mechanism, to reformulate a few questions and to introduce others.

Moreover it made patent the need to develop a "constructs" that will harmonize the use and comprehension of crucial concepts. This "dictionary" must be communicated in a very effective way to refute eventual conceptual misunderstandings.

A special attention must be dedicated to incomplete surveys and unanswered questions. In fact that has already made us reflect about the possible reasons underneath it in order to anticipate both alternative and new questions to the survey as well as to create new ones to integrate the interviews that will follow it.

The open questions where left blank by the majority of respondents but when that did not occur, data responded were relevant for the research purposes. Consequently, and after a deepest analysis of each of the questions we estimate that some will remain open, some will be transformed in closed questions, and others will disappear being transferred to interviews.

Several issues must be deepest researched before the survey occurs. It is the case of the relationship between design, innovation and research. The results of the pilot survey strengthen our interest in the role of the research institutes and technological centers located near some sector clusters that reveal a higher awareness of design role in business. A second topic that will earn our attention is the distance B2B (Business to Business) companies apparently have with consumers and how is this relationship explored by B2C (Business to Consumer) companies. A subject related with this issue is the sources companies stated to use to support market analysis: sales force and international fairs are the most important and consumers and market research the less ones.

We come to conclusions that is needed a strong link between companies association and the team.

Having in mind that final survey might have a different shape when launched it is possible to access it in the version resultant from the reflection made by this work through the link: <http://arqpapel.fa.utl.pt/survey/>. To enter it is needed a username: de..sid@fa.utl.pt. And a password: flux2007.

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