How to Measure Design Contribution to the Competitiveness of Companies: Models for Analysis Tool

António Gomes
Communication and Art Department
University of Aveiro Portugal

ajgomes@ua.pt

Vasco Branco
Communication and Art Department,
Institute for Design, Media and Culture [ID+]
University of Aveiro Portugal

vasco.branco@ua.pt

ABSTRACT
The research presented here, is aimed to design a tool to evaluate the degree of maturity of design intervention, and the investment return from applying design in production companies in the north of Portugal. A theoretical frame is set to support the use and relevance of this kind of tools as a means to generate a set of guide lines on how companies may use design as a strategic tool. Several tools from different countries are evaluated, and a generic model is set to become the base of a support tool development for future researches. This model focuses on the results and on an inter company experience sharing. In the final part of this article, some aspects of the studied models are discussed, namely the results relevance and diffusion for other companies. Issues are raised on ongoing investigations.

Categories and Subject Descriptors
Organizing design in industry.

General Terms
Design, Economics.

Keywords
Design management, assessment design tools, design maturity.

DPPI'11, June 22–25, 2011, Milan, IT

1. INTRODUCTION
Information's and knowledge's convergence from different areas, and the communication between them, sustains the existential conception of the designer profession, set to achieve a continuous development for the best resources application and end user satisfaction. According to Moraes [1], "disciplines as design, for its holistic, transversal and dynamic character, place themselves as possible approaching alternatives to a correct decoding of contemporary reality of a new material culture, in the scope of the second modernity establishing itself" [1] (p.158). For design being a "mixture of knowledge, creation and application" [2] (p. 94), some authors propose the "dissemination of design in every possible area of the company." [1] (p.158).

A new innovation economy is transforming the global business world. To Bonsiepe (1991) "a country that wants to be an actor, and not a marginalized spectator, has to turn design into a pillar to its technological and commercial activities" *apud* [3]. Studies taken by Design Council [4] realized that South Korea and China are rapidly developing their design potential, learning from the West good practices, at the same time as they build their own creative and cultural values. It's common knowledge that production of low value goods has moved overseas. In the UK, this dis-placement is accepted on the assumption that the activities of high value, such as research and development, technology, innovation and design, will remain. In the meantime, it's becoming more evident that not only the production has moved to overseas, but also several high added value activities are moving to countries as South Korea, which is developing their design potential with an ambitious plan [5]. George Cox [6] noted that many emerging economies are positioning themselves as sources of creativity and design, and no longer as mere low cost production suppliers. The report concludes that design competences at national level are needed for a continuous economic sustainability.

1.1 Analysis models
In the field of design management, studies have been set out to understand how companies face design and its management as a competitive tool. Mozota [7] describes a research with a sample of 33 SMEs, all excellent in product design, where they are classified into four classes that characterise and differentiate their design leadership: 1 - Design as a managerial competence; 2 - Design as a resource competence; 3 - Design as an economic competence; 4 - Firms indecisive on the role of design. Her research assumes the use of the concept of value chain to explain different design

management styles (classes) by differences in value chain design systems and validates three levels of design management: operational, functional, strategic. A unique model is developed, where all items of the importance of design to the company value chain system are joined together. The goal is to show how design is involved in the selection process and on the continuous improvement process, setting out a competitive advantage. Mozota proposes a model to explain design as a managerial asset, and states that "Design is not only a competence that can be used for differentiating products and generating a prospective vision of the company sector. Design is also a function within the company structure that modifies processes and innovation management." This exploratory model can be used in a prescriptive way. It defines 3 classes of design management strategy, where managers can locate their own design strategy: 1 - Design strategy as a differentiating positioning; 2 - Design strategy as a coordinating positioning; 3 - Design strategy as a transforming positioning.

The Danish Design Centre [8] has developed the design ladder model, that is useful for grouping companies design maturity on the basis of their attitudes towards design, in four-step:

1 - Design is an inconspicuous part of product development and performed by members of staff, who are not design professionals. Design solutions are based on the perception of functionality and aesthetics shared by the people involved. End-users point of view plays very little or no part at all.

2 - Design as styling. Design is perceived as a final aesthetic finish of a product. In some cases, professional designers may perform the task, but generally other professions are involved.

3 - Design as process: Design is not a finite part of a process but a work method adopted very early in product development. The design solution is adapted to the task and focused on the end-user and requires a multidisciplinary approach.

4 - Design as innovation: The designer collaborates with the owner/management in adopting an innovative approach to all of the business foundation. The design process combined with the company vision and future role in the value chain are important elements.

The higher a company is up the ladder, the greater strategic importance design will play [9].

Another ladder like model is the DM Staircase (DMS) model, with the same four steps, which are deepened by five vectors: Process, Expertise, Resources, Planning and Awareness, making the Design Management Staircase more specific and more detailed (see Figure 1). Another improvement is the focusing on design management, and not only on design usage.

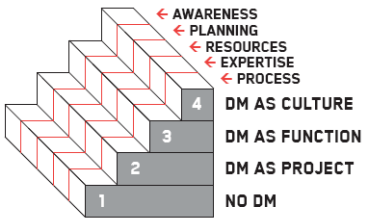

Figure 1. DM Staircase model [11]

In the staircase model, the higher the step, the greater is the strategic importance of design in that company. Its impact is distinguished by different studies, which evidence that a company is more likely to grow when it deploys design in a strategic fashion (including Design Council, 2004, Danish National Agency for Enterprise and Housing, 2003) [10].

Mozota [11] introduces the concept of the four powers of design and identifies why designers are still suffering from lack of recognition and support from managers. She believes that there are two missing links: 1. Designers' lack of knowledge of management concepts and on management as a science; 2. Designers' difficulty in implementing a value model in their everyday practices. She suggests that designers and design managers use the Balanced Score Card (BSC) methodology as a value-based model to measure the impact of design.. BSC methodology is "vision-based, as well as holistic". "The four perspectives of the BSC model neatly coincide with the four powers of design, or the four design values system: customer perspective (design as differentiator); process perspective (design as coordinator); learning perspective (design as transformer); finance perspective (design as good business) [11] (pp 47). The design value model and its application through the Balanced Score Card toolkit provide a common language for designers and managers and this can help the design profession make a change from project-based to knowledge-based" Mozota [11] (pp 53).

Taking for granted the strategic value of design, the search of a common language, of tools that allows attitude evaluation and perspective means of performance adjusted to the context in analysis, is still open. According to Acklin and Hugentobler [12] "The method is to place design-related questions of the participating firms at the beginning of the research process and to help these firms develop individual implementation scenarios that fit their specific situations. These scenarios then improve the development of a Design Management guide (DM-guide), using the maturity scale model as a structuring method. The outcome is envisaged to be a visual orientation device. Similar to a map, it offers pathways, steps and instruments that enable the adoption of design and design management".

2. ANALYZED TOOLS

Aiming to design a tool to analyze the level of maturity of design application, and the design investment results in equipment assets production firms in the north of Portugal, several tools where studied. The methodology implied identifying several tools used in different countries, characterize and compare them, identifying the strong and weak points, according to the tool's own objectives. The set of studied tools where:

- DME Award 2010, Design Management Europe (DME 2010);

- Research on Design Impact on Companies Performance, Getúlio Vargas Foundation, Brazil (RDICP - Brazil).

- Innovation Scoring, COTEC Portugal.

- 10 Points Attitudes, Profitability and Design Maturity in Swedish Companies, Swedish Industrial Design Foundation and the Association of Swedish Engineering Industries (10 Points).

- Dig SID – Diagnostic Tool on Design Use, Lisbon Architecture Faculty, Lisbon Technical University, Portugal (Dig SID)

- Design Industry Research 2010, Design Council, UK.

- "A Mapping of the Danish Design Industry", Imagine, Creative Industries Research at Copenhagen Business School, May 2005.

The studied sample was selected using as criteria the tool's objectives and its origin, and they are all based on a questionnaire form, data processing and results presentation. From the set of tools in analysis two groups came forward. A group of tools has allowed performing studies to characterize design as an activity sector. Many variables where evaluated such as activity distribution between different regions, market dimension, involved professionals, etc. Global and design subsectors results are presented. To this group belong the studies: Design Industry Research 2010 and "A Mapping of the Danish Design Industry". The results obtained by the tools above are not coincident with the tool's to be designed objectives, since these studies globally reflect on the design activity sector and not on the company's universe. Its analysis becomes relevant to understand how to segment the activity and how to identify the main elements for company's characterization. The other group presents tools dedicated to the analysis of design application in companies. The DME 2010, was developed according to the DMS model, and presents a 18-question inquiry, divided by the models five dimensions: Awareness (4); Planning (4); Resources (4); Expertise (3); Process (3). The questions posed are either multiple choice or company applicability selection, with valorisation. The online tool results are presented individually in graphic shape, by dimension, position relative to design management by steps and improvement guidelines. The tool applied in the study RDICP - Brazil, contains a query with a total of 11 multiple choice questions or company applicability selection, with valorisation, but without formal division. To make it easier to analyse and compare different tools, the following divisions where identified: Qualification (3); Vision, applicability, investment and innovation (6); Resources (1); Results (1). Results are disposed by industrial sectors, in a graphic style representing the whole set of responses from companies who answered the query. The Innovation Scoring tool, which aims to be a self diagnostic instrument of innovation capacities and performance. The tool is composed by a query with a primary group of questions, to characterize de answering company. The query to obtain the Innovation Index has a total of 43 questions set on four pillars: Conditions (12); Resources (13); Processes (10); Results (8). On the first three pillars the questions are evaluated by the answerers according to two points of view: approach and application, on five level scale for each point of view. The result is offered by company trough the Innovation Index, which places the company on a scale from zero to one thousand. Data retrieved from all of the answering companies, is published as aggregated results (IDI barometer), comparable to other countries. The tool used in the 10 Points study, consists of a query whose total number of questions is unknown. For the first five points submitted to analysis, five multiple choice questions were identified, and it wasn't possible to identify the remaining five points. From the results, three groups were identified: Attitude (5); Financial payback (3); Maturity (2). The results come forward as a representative graphic of all the gathered answers form the answering companies. The "Design Ladder" concept is used to stratify the analysis according to company's maturity. The Dig SID, applies a query with a total of 26 questions with no formal divisions. For analysis the following groups where identified: Qualification (8); Vision, planning, resources, knowledge and process (17); Results (1). The set of questions belonging to the second group matches the axes of the DMS model, but the questions are randomly placed in the query. The questions are either multiple choice or company applicability selection, with valorisation. The results are presented by company, ordered by "Design Ladder" model, followed by a justification. Improvement recommendations are made according to the obtained results. There are also presented joint results of the "Design Ladder" positioning of the answering companies.

3. TOOL ANALYSIS AND GENERIC MODEL PROPOSAL

A tool comparison has been made, by interpreting the queries and cataloguing the questions within the following categories: company qualification, DMS model five vectors and results questions. The total number of questions and the existence of analytical formal groups are identified (Table 1). Analysing Table 1, it's evident that the total number of questions varies from a minimum of 11 to a maximum of 43, where in this 43-question tool there is yet another set of qualification questions preceding the query itself. Two of the tools have a formal division in question groups. This division is quite interesting in result analysis, as it brings up the relative positioning of the strategic vectors represented by the groups. Four of the tools make a previous company qualification. This characteristic seems essential for further results segmentation and for the perception of possible different contexts between activities.

Table 1. Tools comparison by categories

	DME 2010	RDICP - Brazil	Innovation Scoring	10 Points *	Dig SID
Total Questions	18	11	43	-	26
Formal Groups	5	No	4	-	No
Company Qualifying	No	Yes (4)	Yes**	2	Yes (8)
Awareness	4	4	8	2	6
Planning	4	1	4	1	4
Resources	4	1	13	2	2
Expertise	3	-	-	-	2
Process	3	-	10	1	6
Results	0	1	8	2	1
* Analysis based on results published ** Qualifying questions precede 43 question survey					
Groups Identified According DM Staircase					

In the proposed five vectors in the DMS model, not every tool have questions on the five vectors. The Awareness, Planning and Resources vectors are questioned by all tools somewhat proportionally to the total number of questions. The DME 2010 has the more balanced question distribution by the five vectors. This equilibrium may not be important, if the questions asked in each vector characterize it conveniently. The Expertise vector was identified in only two of the analyzed tools, fact that might be explained by a possible confusion with the Resources vector. Only one tool leaves out the Process vector, since this tool may be more focused on the company activity sector, rather than the company itself. The Results group is studied by all tools but one, and it allows one to validate companies investment in design.

Attending to the above analysis, a generic model is proposed in Figure 2, for a design survey that allows to: understand the role of design inside an innovation process; measure, in fact and in a concrete way, what design represents in design applying companies results; identify "good practices" and create and spread a set of guidelines appropriated to each company's specific context. The model is based on a query structured in two generic and four key analysis groups: Company qualifying (generic); Planning; Resources; Expertise; Process and Results (generic). Each group must have enough questions, in number and content,

in order to describe it rigorously. Key groups questions may be evaluated by two points of view, approach and application, using a scale adjusted to each one. From the approach point of view, the company's understanding of the problem or the company's vision is perceived. From the application point of view, the performance of the company in that vector is perceived. By analysing the key groups questions from the approach point of view, data is been gathered from the Awareness vector of the DMS model, in a specific way for each question. On the generic group questions, the evaluations will have to be direct to assess what really happens. Analysing a representative group of companies, namely on context, attitude and result, it will be possible to know the system and spread fitting guidelines to a specific context.

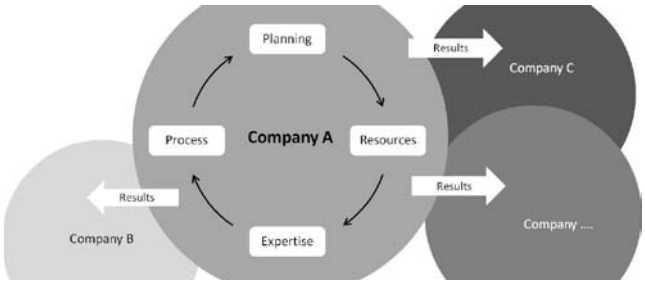

Figure 2. Generic model proposal

Crucial to make these tools valid, is the sample representativeness of the companies inquired. On this investigation, it wasn't evident in most of tools the way the sample was controlled. Many of these tools are online and anyone can make a register and use the tool, concurring to damaging the data set by lack of sample control. One should only consider valid, the results related to the company and its comparison to a possible theoretical pattern obtained by controlled and reliable data. For some tools, the answer is motivated by a possible award or distinction, which has the merit to control the veracity of the answer, but on the other hand, keeps away companies who have no abilities to be distinguished. It will be necessary to create mechanisms to assure sample representativeness, and consequently allow results diffusion.

4. CONCLUSIONS

All tools in analysis have strong and weak points. The use of a universal language to compare results is consensual. The DMS model is a good starting point for that universal language, yet a few questions remain unanswered, namely on what to think of the expression "the higher a company is up the ladder, the greater strategic importance design will play, and that a company is more likely to grow when it deploys design in a strategic way". Does the Return on Investment in Design (ROID) always raise as we go up the ladder, or the positioning in the different steps that maximizes ROID must be adjusted to the company's context? What means a company standing on different steps for the different vectors in analysis? The results evaluation importance is raised by these questions, which brings us to another question: what is the best way to quantify ROID, considering the intangible character of most of design activities?

The matter of guidelines' diffusion, when a company wants to learn from another's experience, based on a set of data that might not fit that company's reality, also needs deeper study and analysis. Adequateness is now placed on different levels.

The proposed model has the capacity to compare data in an aggregated way, and to measure the attitude impact towards design, through generic groups, company qualification and results. The question evaluation method of the key groups, from one point of view gives us the perspective of reality, and on the other point of view, the company's vision. This information is important to perceive design activity evolution tendencies. Many questions remain open to investigation.

5. REFERENCES

[1] Moraes, D. D. 2008. *Moda, design e complexidade*. In D. B. Pires, *Design de Moda: olhares diversos* (pp 155-161). Barueri, Estação das Letras e Cores Editora, SP

[2] Heylighen, Ann; Cavallin, Humberto; Bianchin, Matteo. 2009. *Design in Mind* In Design Issues, Volume 25, Number 1. Massachusetts Institute of Technology p. 94-105.

[3] Peleteiro, R.G. & Pequini, S.M. 2002. *O Design como instrumento estratégico de promoção de competitividade industrial.* Anais do Congresso em Pesquisa e Design, P&D, 5, 10 a13 de outubro, Brasília: UnB, p.697-701.

[4] Design Council 2010. *Lessons from Asia, Report on the multidisciplinary design education fact-finding visit to South Korea anda China*. Design Council, London.

[5] Moultrie, J. & Livesey, F. 2009. *International design scoreboard: initial indicators of international design capabilities.* University of Cambridge, Cambridge

[6] Cox, G. 2005. *The Cox review: enhancing the role of creativity in driving the productivity performance of SMES in the UK.* Design Council, London.

[7] Brigitte Borja de Mozota, 2002. *Design and Competitive Edge: A Model for Design Management Excellence in European SMEs*, Design Management Journal, Academic Review, Volume 2, pages 88-103.

[8] Danish Design Centre, 2003. *Economic effects of Design, Report for National Agency for Enterprise and Housing*.

[9] 2004. 10 Points Attitudes, Profitability and Design Maturity in Swedish Companies, Swedish Industrial Design Foundation. http://www.svid.se/sv/English/About-design/Surveys-and-reports/.

[10] Gert L. 2009. *The incorporation of design management in today's business practices: An analysis of design management practices in Europe*. CBRD, INHOLLAND University of Applied Sciences, Rotterdam, The Netherlands.

[11] Brigitte Borja de Mozota, 2006. *The Four Powers of Design: A Value Model in Design Management*. Design Management Review, Design Management Review, Volume 17, Issue 2, pages 44-53.

[12] Acklin C., Hugentobler H. K., 2007. *Design Management for Small and Medium Sized Enterprises: Development of a Design Management Guide for the Use of Design and Design Management Within Corporate R&D and Decision Making Process*. International association of Societies of Design Research, The Hong Kong Polytechnic University, 12 to 15 November.

Este trabalho é financiado por Fundos FEDER através do Programa Operacional Factores de Competitividade – COMPETE e por Fundos Nacionais através da FCT – Fundação para a Ciência e a Tecnologia no âmbito do projecto PEst-C/EAT/UI4057/2011 (FCOMP-01-0124-FEDER-D22700)