

KNOWLEDGE MANAGEMENT AND PRODUCT DESIGN PLANNING: EXPLORATORY CASE STUDY IN THE SPANISH CERAMIC SECTOR

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ABSTRACT

This work studies the relation between knowledge management and product design planning in the Spanish ceramic sector. Starting with an exploratory case study in a company from the ceramic tile sector, a theoretical model has been derived linking the type of existing information in the company with the need to plan product design. Based on this, an instrument is proposed relating to information on the market directed to commercial agents, who would contribute general information about their clients or ceramic distributors, their products and the communicative elements of their exhibitions.

INTRODUCTION

Product design is an essential aspect of the innovation process (Aubert, 1982; Walsh, 1996) and of the development of new products (Jenkins et al., 1997), which is reflected in their apparent importance in upgrading competitiveness and business performance (Potter et al., 1991; Walsh et al., 1992; Roy and Potter, 1993; Trueman, 1999). Product design is considered as the formalisation process of a product in terms of functional requirements of use, production and communication, not only involving a creative act but the convergence of technical, market and strategic aspects (Walsh, 1996; Dumas and Mintzberg, 1991). This product design process includes two phases (Topalian, 1980): an analytical-conceptual or design planning phase, and a techno-creative phase (Nueno, 1989; Cooper and Press, 1995; Iváñez, 2000).

For Trueman (1999; p. 120), most researchers and academics in this field coincide in considering the planning phase to be the most important, or where the difference is established between product success and failure, though this is not a very widespread activity in the companies.

The analytical or design planning phase attempts to evaluate different aspects to determine the attributes of the product, among which information on the market, company and technology stands out (Rothwell and Gardiner, 1989; Bruce and Cooper, 1997; Iváñez, 2000).

On the other hand, companies have a great quantity of information, but people that need to access this information and use it to take decisions have difficulties in doing so. One of the greatest problems in the companies is that it is not known what and how much employees know, and how this knowledge can become explicit (Camisón and Chiva, 2001). As a result knowledge management, understood as the effort to capture, organise and share what company employees know (Camisón and Chiva, 2001), or the process that assures the development and application of all types of relevant knowledge in a company, with a view to improving its problem-solving capacity and thus contribute to the sustainability of its competitive advantages (Andreu and Sieber, 1999), could play a key role in the analytical conceptual or design planning phase, on facilitating information and knowledge concerning different aspects of the company, the market or the technological situation for people making decisions in product design.

This work describes a research project that attempts to relate knowledge management with product design planning. For this, an exploratory case study has been conducted, based on which a theoretical model was developed that allows deriving an instrument for obtaining information.

This study is part of one of greater scope, which will culminate in the materialisation of a computer application that translates all the data and information into knowledge for taking decisions on product design.

THEORETICAL DESIGN

Knowledge Management

According to Alavi and Leidler (1999) there are three approaches to knowledge management: one based on the concept of information (Arteche and Rozas, 1999), another

much more centred on technology and ICT (López and Cartwright, 1999), and a third, dominated by concepts close to the idea of corporate culture and narrowly linked to organisational learning. The first two are the most common senses (Andreu and Sieber, 1999), mainly for businessmen. The third is more common in academic works on Business Administration (Nonaka, 1994; Hedlund, 1994; Ichijo et al., 1998).

Within what would be the second approach, knowledge management can be understood as a process that encompasses different activities (Maté, 1999): first, integrating the information, seeking it, capturing it, storing it, accessing it, retrieving it, navigating through it, coding it, referencing it, categorising it and cataloguing it. Secondly, extracting the sense of incomplete information, trying to supply the necessary information (the right amount, neither too much nor too little) to make decisions. Thirdly, upgrading the information, assuring its continuity through processes fed by people and supplied by ICT (Information and Communication Technologies) tools.

The objectives of knowledge management are (Maté, 1999): first, to get institutions or the companies to act as intelligently as possible to assure their viability and overall success. Secondly, be aware of the best value in their knowledge assets.

Both objectives require the organisational agents to possess or be able to possess knowledge, who if treated intelligently, can enable taking better corporate decisions.

Product design planning

The design planning or conceptual analytical phase of the product design process (Cooper and Press, 1995), evaluates the socioeconomic context of the market it is intended for, the socio-cultural context of the product, commercial and strategic, industrial, production, logistical, company image and communication, technological, tendency aspects, etc., all which determine product attributes.

One of the most important activities in product design management consists of assuring this basic and previous information in order to conceptualise the product (Chiva, 2000). Rothwell and Gardiner (1989) consider design management to include various aspects, set out below, among which the first three are particularly noteworthy, closely linked to the conceptual analytical phase.

- 1) Knowing and situating the company, its products and main technologies, in relation to competing products and companies.
- 2) Defining where the company wants to act and where it does not, in terms of technologies, products and markets.
- 3) Defining the options and routes, from a rational point of view, based on company weaknesses and strengths.
- 4) Stimulating the dialogue between product development, production, marketing and financial personnel to discover and evaluate potential markets for existing products and the possibilities of new products for current markets.
- 5) Making the idea of design and innovation part of the corporate culture, something absolutely necessary for the company to be profitable in the long term.

In a case study in the Spanish ceramic sector, Chiva (2000) considers that one of the two design management activities is knowledge of the company, market and technology, which is intimately related to the conceptual analytical phase of the product design process.

In relation to the information on the market, Iváñez (2000) considers that there are three types, information on consumer motivations (knowing the stimuli and constraints bearing on the consumer in purchasing, consumption tendencies and tastes), information on industrial markets (suppliers and competing companies), and lastly information on circuits and sales outlets.

Summary

Figure 1 sets out the implicit ideas in both theoretical concepts and their connections. It was attempted to make this relation operational and concrete in terms of the daily problems faced by a company requiring efficient knowledge management to plan the design of its products.

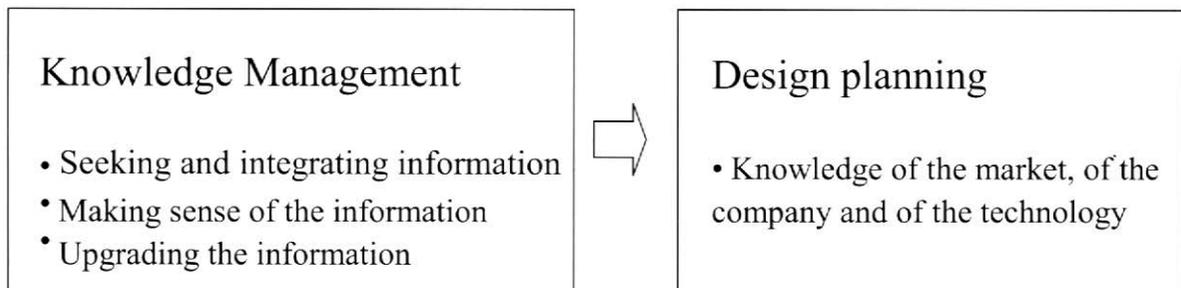


Figure 1: Knowledge Management and Design Planning.

CASE STUDY

Selecting the case

To carry out the project, a Spanish ceramic floor and wall tile manufacturing company was selected (Table 1). The selected company had to exhibit sensitivity and concern for the topics outlined, since it would need to allow us to act in the company and submit proposals, besides doing some interviews. Thanks to the knowledge of the sector of the ALICER technologists, we were able to select this company, which recognised the need to improve design planning and the importance of knowledge management in the company, as well as recognising its incipient state in the company.

CHARACTERISTICS	COMPANY
Established	1972
Turnover 1998	36,359,393 euros
No. of workers	281
% export	60%

Table 1: General characteristics of the company.

Data gathering method

To perform the case study, we had at our disposal the company's human resources, especially their team of sales staff, designers and those persons that are part of the decision-taking process in product design, while some of their clients or ceramic distributors were also contacted and visited. The method of gathering information was fundamentally based on structured individual and group interviews of experts as well as company personnel and clients, although other information sources were also taken into account such as observation, files and secondary data.

The structured interviews sought to discover which aspects were perceivable by the commercial agents and which aspects were required by the product design deciders for planning.

Data analysis

Unlike investigation centred on hypothesis confirmation, inductive investigation lacks a generally accepted model of protocol (Eisenhardt and Bourgeois, 1988, p. 741). However, it is important to establish one, besides a database with all the gathered information, distinguishing it from actual data interpretation, since it provides the work with reliability and consistency (Yin, 1989; p. 45).

Therefore, in the absence of a standard protocol, we used the following model: firstly, we interviewed those in charge of the company and of the project in order to determine concrete details and to decide aspects on which to place special emphasis.

In second place, and having established the aspects to be addressed in depth in product design planning: knowledge of the market, interviews were conducted with experts in ceramic product design, both technologists as well as professionals from the company, in order to prepare a first proposal of market factors to be taken into account in design planning.

In the third place, the company reviewed the model or instrument, advancing proposals. For this, we interviewed different agents that participate in the product design process: sales staff, designers, laboratory technicians, production and communication technicians.

In the fourth place, we visited and interviewed company clients in a specific market: that of the province of Barcelona. The main purpose of these visits was to verify *in situ* if the instrument was usable, as well as its degree of efficiency, besides other aspects.

Finally, the model was revised by interviewing different members of the company, thus preparing the definitive model.

RESULTS: THE INSTRUMENT

The company decided that the aspect to be addressed in depth, especially in design planning, was knowledge of the market, because they understood that its dynamics led to taking decisions on products in quite an intuitive way. They also recognised that the company's commercial agents had knowledge of the market that was not transmitted to the people that decided on products, at least in a detailed way. Furthermore, it was

recognised that if a database was available with longitudinal information on the different markets, the evolution could be described of characteristics such as shapes, colours, tendencies and tastes in each of these markets, in order to make consistent decisions on products.

Therefore, the sales team would be in charge of providing the information on the market. But to do this it was necessary to provide them with an instrument or questionnaire, which they would complete after each visit to the ceramic product distributors or clients. The set of questionnaires received from each salesman would allow analysing tendencies. The questionnaire needed to be short and very clear, as it was to leave very little room for interpretation, and be very easy to fill in by sales staff. This would enable subsequent processing in a computer database. It was therefore decided to draft a questionnaire with mostly closed questions.

The definitive instrument (annex) needed to be completed by the company's commercial agents and those responsible for different geographic market areas. The instrument should provide an information flow. That is to say, design planning has a dynamic character, so that it needs information of the same type.

The instrument consisted of 3 types of reports:

- A) A static report on the ceramic product distributor (to be completed once, updating it every so often: 2 or 3 years).
- B) Dynamic product report (to be completed whenever a visit was made to a distributor).
- C) Dynamic communication report (to be completed approximately every 6 months).

Reports B and C were to be completed immediately by the salesman after a visit to the distributor (never during the visit itself). Before the visit, the salesman would be expected to establish which aspects to focus on or to investigate at the distributor client.

CONCLUSIONS

In this project an instrument has been developed that allows better management of the knowledge relative to ceramic product design and which improves design planning. However, to make it operative, generating the computer application is of great importance, as it will enable transforming the data in relevant information and knowledge. This is currently in the conception process.

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ANNEX

A) STATIC DISTRIBUTOR REPORT

NAME DISTRIBUTOR (SHOP): _____

SHOP ROOM (m2): _____ Space devoted to ceramic floor and wall tiles: ____%

DISTRIBUTOR ADDRESS:

- Street / Av.: _____
- Town: _____
- Province: _____
- Country: _____
- Location: centre (___) / suburbs (___)
- Zone: rural (___) / urban (___)

NAME/S SELLER/S at the sales outlet:

- 1) _____
- 2) _____

- Product knowledge of sales staff:
high (___); medium (___); low

TYPE OF CLIENTS AT THE SALES OUTLET (percentages)

- Other shops (___ %); Professionals (___ %);
Builders (___ %); End consumer (___ %)
- Age of end consumer at the shop (percentage):
18-45 (___ %); 46 or older (___ %)
- Purchasing power of end consumer at the shop:
low (___ %); medium-low (___ %);
medium-high (___ %); high (___ %)

¿WHAT NON-CERAMIC PRODUCTS ARE SOLD AT THE SALES OUTLET?

Bathroom fixtures (___) Baths (___) Showers (___) Kitchens (___)
Parquet (___) Natural stone (___) Others _____ (___)

B) DYNAMIC PRODUCT REPORT

Date: ____/____/____

Name of agent of Italcerámica: _____

NAME OF DISTRIBUTING COMPANY: _____

Province: _____

MOST IMPORTANT COMPETITORS IN THE SHOP (percentage):

Company 1: _____(____%); Company 4 : _____(____%);
 Company 2: _____(____%); Company 5 : _____(____%).
 Company 3: _____(____%); Company 6 : _____(____%).

Arrangement of our product in the shop:

∞ Front (____); Middle (____); Hidden (____)

Opinion of the distributor (seller) regarding Italcerámica:

∞ content (____); indifferent (____); discontent (____).

Opinion (Complaints) of the distributor concerning our product:

PRODUCTS THAT SET A TREND OR STAR PRODUCTS:

	MODEL	MANUFACTURER
1 FLOOR		
2 FLOOR		
1 WALL		
2 WALL		
1 TRIM		
2 TRIM		

C) DYNAMIC PRODUCT COMMUNICATION REPORT

Date: ____/____/____

Name of agent of Italcerámica: _____

NAME OF DISTRIBUTING COMPANY: _____

CATALOGUES- ¿Is the Italgres catalogue up to date? yes (___) no

PANELS : Appearance of our panels:

- Broken or old (___); New (___);
- Hidden (___); Visible (___)

DISPLAYS :

- When was the Italgres display renewed? ____/____/____
- Is the appearance appropriate for the shop? yes (___); no
- Does it stand out compared to competitors? yes (___); no (___)
- What are the displays like of the most important companies in the shop? materials: _____; aesthetics _____
- Does the seller provide any ideas or criticism in this regard?

OTHER TYPES OF COMMUNICATION

- What other types of communication are our competitors using? 3-page leaflet (___); leaflet (___); Others: _____
- Are there PCs – multimedia in the shop? yes (___) no
- Are PCs used in the relation with his clients? yes (___) no (___)

PRODUCTS NOTICED AT THE SALES OUTLET (SHOWROOM) OF THE DISTRIBUTOR

FLOOR TILE (___%)	WALL TILE (___%)	TRIMS ___%)
<p>Sizes: _____</p> <p>50s (___%) 40s (___%) 30s 20s (___%) 10s</p>	<p>Sizes: _____</p> <p>large (___%) medium (___%) small (___%)</p> <p>Square (___%); Rectangular (___%)</p>	<p>Type of _____</p> <p>Flooring borders: (___%); Wall tiling borders: (___%); Hand made borders: (___%) Rosettes: (___%); Capping (___%); Insets (___%); Compositions of various pieces</p>
<p>Colours</p>	<p>Colours</p>	
<p>Graphic repertory :</p> <p>Innovative (___%); Traditional</p> <p>Glossy (___%) Matt</p> <p>Relief (___%) Polished: (___%)</p>	<p>Graphic repertory:</p> <p>Innovative (___%); Traditional</p> <p>Glossy (___%) Matt</p> <p>Relief (___%) Polished: (___%) Craft ceramics (___%)</p>	<p>Graphic repertory :</p> <p>Innovative (___%); Traditional</p> <p>Classic (Roman): Relief (___%)</p>
<p>Marble (___%); Rustic (___%); Plain (___%);</p>	<p>Marble (___%); Rustic (___%); Plain (___%);</p>	<p>Other remarks on THE NOTICED PRODUCTS:</p>
<p>Whiteware (___%); Redware (___%) Porcelain tile (___%); Glazed porcelain tile (___%)</p>	<p>Whiteware (___%); Redware (___%) Porcelain tile (___%)</p>	