

Exploring Design Efforts of Smes: Integrating Industrial Design in Medical Device Sector in Turkey

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Abstract

This paper aims to present the challenges of medical devices industry SMEs in OSTIM/Ankara and to explore how small firms invest in design expertise to develop new products. The research reported here stems from design perspectives of a medical device SME operating in OSTIM and the empirical basis of the study focused particularly on the use of self-completion design communication logs of circulating capital project that conducted by SANTUM (Gazi University). The key findings of the research reports “silent design” in firms and specific nature of design collaboration projects to anticipate both sides overcome these challenges.

Keyword: Industrial design, medical Industry Cluster, SMEs, OSTIM, SANTUM.

1. Introduction

Over twenty five years ago, Gorb and Dumas introduced the *silent design* phenomenon which was “[...] a great deal of design activity goes on in organizations which is not called design” and that “[...] carried out by individuals who are not called designers and who would not consider themselves to be designers (1987, 152).” Later Norman noted on the fact that most design work is “[...] not done by designers, it is done by engineers, programmers and managers (1988, 156)”. Despite the intervening period, today, same phenomenon can also be examined in Turkish small and medium-size enterprises (SME’s) where design tasks can be done by anybody with a modicum of common sense (Mercer, 1947).

In this paper, the concept of competitive power of design and ways and means of improving competitive powers of small and medium enterprises (SMEs) are discussed. This article presents a consultant design experience of a Turkish SME in medical industry where design skills are often marginalized and silent. This article also reports on research that aimed to understand how the sample SME passed through stages of silent design to superficial styling to tart up an existing product. Additionally the study searches for way of the introduction of strategic design in Turkish small and medium-size enterprises to provide distinctiveness with the contribution of both academic understanding and an industrial practice. But before everything else this study, first will address the traditions and organizational culture of the Turkish small and medium-size enterprises then will specify the changes needed for transition to strategic design view. This is because SME’s play a particularly important role in the Turkish economy, because of their number and due to the large share of the workforce involved. On the other hand their average profile is different from that of SMEs in the European Union or in most other OECD countries in that their average workforce and turnover are much smaller and they also lag well behind in terms of know-how, skill levels, capital investment to support their activities, and access and ability to take advantage of modern technologies, especially in the information and communications fields (OECD, 2004).

2. Turkish SMEs

99.5 per cent of the manufacturing firms operating in Turkey are SMEs (KOSGEB, 2012) and they create 61.1 per cent of the employment and 27.3 per cent of the value-added (Power, 1998, p. 150). Therefore, as they fuel the economic growth, provide flexibility, engage in bridge-building between Turkey and the European Union, and promote employment (Napier, Serger & Hansson, 2004), SMEs form the backbone of the private sector in Turkey.

On the other hand, Turkish SME's are often confronted with problems that are uncommon to the larger companies and multi-national corporations like their comparables in the world. The problems faced by SMEs are more or less similar in nature and these problems include financing, poor infrastructural facilities, lack of skills in international trade; bureaucracy, high rate of enterprise mortality, shortages of skilled manpower and mainly low level of entrepreneurial skills due to operating in a particularly unstable and unfavorable macroeconomic environment characterized by high inflation and a succession of deep recessions and sharp upturns. Nevermore SMEs have success factors that include high flexibility, motivation of employees, innovation, reliability and customer loyalty as well as customer specific goods and services (Schneider, 2004).

If the topic is examined in terms of competitiveness in SMEs, sustaining innovative and entrepreneurial climate in SMEs become important. Most SMEs are already at the limits of their ability in handling organizational growth and the formal processes of innovation (Cawood, 1997) due to limited resources and capabilities for conducting in-house R&D activities (Hausman, 2005). In contrast, the offerings from the smaller firms are more likely to be true innovative steps (Cawood, 1997) and a source of most innovation (Schumpeter, 1934) with great operational expertise and customer knowledge (Dahl and Moreau, 2002) and effect of "smallness" that gives ability of flexibility (Taymaz, 1997) and efficiency.

In Turkey, accessing to finance is often mentioned as a key factor and major barrier hindering the development of innovation in SMES (European Commission, 2004). On the other hand, SME sector's capability to promote internationalization and exports is another problematic area for Turkish SMEs which are not prepared for engaging and competing with foreign companies (Napier, Serger & Hansson, 2004). Today as productivity rests on how companies compete (Porter, 1998), sharing knowledge, relationships, and motivations under providers of specialized infrastructure – in cluster and organized industrial zones is a critical comparative advantage for SMEs to access finance and reach global markets and corporate markets. To ensure efficiency and increased profitability in production by gathering together industrialists working in similar fields, and, as a result, to encourage spin-offs, under a common plan and to prepare the industrial infrastructure for investment; Turkey has established several organized industrial zones and operates them under state supervision (Code No. 4562). The greatest in Turkey, barely one of the small and medium sized industrial manufacturing areas in the world, The OSTIM (established 1967) is one of that organized industrial zones in Turkey with 5.000 companies, 50.000 employees under 17 main sectors.

3. Brief Information on OSTIM and OSTIM Medical Industry Cluster

OSTIM, an Organized Industrial District in Ankara, Turkey, is being the largest and organized industrial SME agglomeration in the country, having approx. 5.000 enterprises, 50.000 employees, acting in 17 different industrial sectors and 139 lines of business. The main productions are Machine Manufacturing, Metal Processing, Electric-Electronic, Construction Machines, Manufacturing Equipments, Plastic-Rubber and as well as Medical Equipments. The target of OSTIM is "[...] to be a more competitive industrial region that completes all the infrastructure requirements, does high-quality but low-cost production, has competitive power, can move with synergy, retrieves the knowledge and talent of benefiting university-industry cooperation, follows the worldwide production technologies (Aydın, 2011)"

OSTIM tends to coalesce and work as *one factory with its whole units* with the advantage of flexible manufacturing potential of embedded SMEs. The region is also paying attention to focus on clustering studies where the competitiveness of one company is related to the performance of other companies and other factors tied together in the value-added chain, in customer-client relation, or in a local or regional context (Porter, 1990). In this context, in 2007, the Analysis of the International Competitiveness Level of the sectors operating in OSTIM work has been done and the collected data is analyzed with the diamond economical model (Porter, 1990). As a result of this study Construction Machinery, Renewable Energy and Environmental Technology, Defense and Medical Industry are defined as target sectors on which ideal infrastructure must be installed (OSTIM, 2011).

OSTIM Medical Industry Cluster has been established after the mentioned study which conducted in 2007 with the goals of increasing the share of domestic production in Medical Sector need and introducing OSTIM SMEs in the international medical market. The cluster also aims collaborate with universities as well as creating a regional competitive advantage with specialized sector. The cluster has 48 confirmed members with 1240 employees.

In details the firms have 407 graduate staff and 153 engineers and the number of staff who knows foreign language is 127. In 2012 the cluster has received direct financial support from Ankara Development Agency by call for proposal method for the establishment of industrial design coordination center on medical technologies.

4. Design and Innovation Activities in Turkish Medical Sector SMEs

In Turkey medical industry/device sector carry out their activities under the pressure of cost-containment policies. The public sector is the main supplier in this sector and procurement systems of the public organizations are forcing companies for low-price policies. Under these circumstances, new product development processes are ignored if new requirements are not written in tender specifications. On the other hand domestic companies are forced to innovate without bending over costs due to increasing number of innovations in medical devices and the interest of the foreign firms in the health sector market forces. In recent years, many domestic medical device manufacturers are facing increasing competition from competitors entering the market from China with extremely aggressive low prices. Also western manufactures raid the market with strong distribution network and payment facilities to supplant high marketing costs. "Being a Turkish Brand" is claimed to be a barrier to persuade the key agents (such as healthcare professionals or decision makers in institutions).

Many SMEs are complaining on lack of equities or risk capital to fight with global giants as Siemens or GE and request incentives. As incentives promote or encourage firms and help the firms to utilize the physical and human capital that exists (Lall, 1992) unfortunately many Turkish SMEs perceive incentives as cash rewards of direct donation without fulfilling the requirements as documenting, monitoring and reporting.

Last but not least; there are limited number of systematic data about medical device sector and there weren't any reliable policy action to enhance the competitiveness by innovation and productivity by clustering until 2010s. In this case being distributor of foreign products become more attractive in participating tenders in a more confident way.

5. The Case of TEKNOMAR Ltd. Co.

5.1 Case Study Research Methods

The main method used in the research is the design communication logs of Gazi University SANTUM (Research and Implementation Centre for Arts and Design). As the interpretive research is criticized due to validity of the results, self-completion diaries, journals sometimes a series of semi-structured interviews about project and logs can generate valuable information (Alaszewski, 2010) and can construct pictures of social reality from the actors' perspective (Plummer, 2001). Logs were completed over contract period to provide a rich source of information on respondents' behavior and experiences on a daily basis, by three key personnel of SANTUM; all of whom were directly served as the design consultant.

5.2 Company Profile and Design Perspective

Teknomar Ltd. Co. (Teknomar) (founded in 1993 and located in OSTIM / Ankara) manufactures devices under Teknomar Brand such as Surgical Tool Sterilization Devices, Clean Room and accessories, Biosafety Cabinets, Air Purifier and Climate Systems. The firm mainly focuses on Hydrogen Peroxide Sterilization Devices, Industrial Type Ethylene Oxide Gas Sterilizers, Asepticizers and exports them to 20 countries. Teknomar also has ISO 9001:2008 and ISO 13485:2003 quality management system and our products are CE-certified according to 93/42/MDD.

In July 2011, the firm signed up a design consulting contract with Gazi University SANTUM to perform design of Hydrogen Peroxide Plasma Sterilization Device in accordance with the terms and conditions set forth in circulating capital directives of the university. First face to face meeting (5.7.2011) between firm and SANTUM was about the product range of the firm and understanding their needs and design perspective.

The design perspective, in other words how design is understood within the company, was mainly on cost reduction and regulations, standards and *creating more soft edges as giant rivals do* were constantly part of the 'design vocabulary'. In the firm, the design efforts were not systematically or formally cultivated and maintained like many other business processes as engineering and the aspects of design were, to some extent, 'silent' due to highly qualified technical knowledge of the owners of the firm. Another cause for silent design was because of the close interactions of employees and management (Press and Cooper, 2003) where the firm was family-owned.

Within Teknomar much of this information for design process was coming from technical literature and the management was proud on technical superiority, on the other hand was complaining due to their *electrical service panel looking* devices compared to their global rivals (Figure 1).



Figure 1. Existing Hydrogen Peroxide Plasma Sterilization Device of Teknomar Ltd. Co.

5.3 Design Process

According to the design contract, SANTUM's Services consist of the design of Hydrogen Peroxide Plasma Sterilization Device based on the approved Preliminary Technical Documents obtained by the Owner (Teknomar). The design work has been done in three stages. The first stage was the Preliminary Design Phase, to define the three concepts of the project. The second phase, the Design Stage, was about the detailed design of the actual selected one concept. The third, the last stage, the Construction Documents, was including the final versions of the drawings and advising on the production of vacuum dies of the panels of the device.

The contract was provided by SANTUM and arranged according to the characteristics of Turkish SMEs. Yet the most of Turkish SMEs want to *choose the best suitable one from exceedingly numbers of proposed design alternatives*, the contract limited the proposed alternative number with three. As the most of Turkish SMEs deliberate or defer making a decision on critical issues as design due to limited risk capital, the contract also urges the Owner to choose one alternative for detail design permanently. Lastly, most of the SMEs are looking for continuous support of the designer at the preliminary production stage; the contract covers support services in the prototyping stage to facilitate consistency between concept and production.

Medical device industry is always known as fast-growing, highly innovative, and intensely competitive industry characterized by ready access to technology through links to shareholders (Rochford and Rudelius, 1997). On the contrary, in Turkey medical device industry is dominated with SMEs which try to realize innovation but traditionally face high transaction costs and financial problems that hamper innovations. On the other hand, yet innovations of SMEs depend on specificities of that region (Kaufmann and Todtling, 2002), most of the OSTIM SMEs see cosmetic touch-ups on the existing product as product innovation. Precisely for this reason, in the first design meeting, Teknomar has limited the scope of design work due to the limitations of costs. It was predominately facilitated by the cost-clamp within the company that one manager described thus, *check this catalogue... this is a German product you see curves...the structure of the device is fixed and untouchable...we can't chance the place of the monitor...we need more soft edges as Germans do.*

With this limitation SANTUM proposed three concepts on 19.07.2011 where silent design was pervaded (Figure 2). The proposals were designed according to limitations of cost and firm-specific 'embodiedness' (Lam, 2000) on technical issues. Throughout the design process in Teknomar, the aluminum structure and the locations of interface, which have been decided previously, acted as the most determining factor for the design.

For this reason, the designs formed on the base structure and not interfere in the interface, in this state, design are limited by proposals on only the edge profiles and panels. It was just a cosmetic touch, not an overall design process due to lack of brave steps that may move the organization products in world class. The situation was not depending on the personal characteristics and experience of the owner/manager (Young and Sandhu, 1995) but also depends of the production limits of the subcontractor who produce vacuum formed PE panels for the firm.

This attitude toward is design work is likely to be common in Turkish SMEs and shows how do Turkish SMEs fit design activities into their business with the limitations of concrete project working data (parameters, files). Despite this strong commitment to supporting industrial design within SMEs, with the slack resources essential, most of the design efforts are limited by the previous and fixed design decisions of silent and mostly technical design. This problem is common in SMEs with a few important exceptions yet the universe of SMEs covered by a specific niche product which has developed by a mainly technical research carried out over the years.

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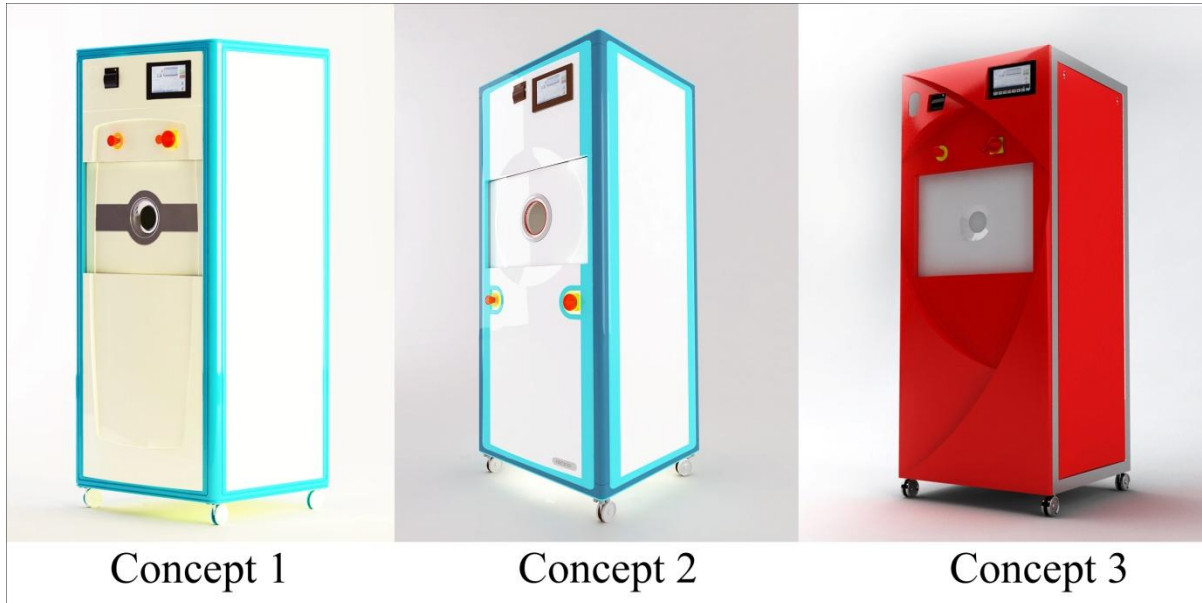


Figure 2. Proposed design concepts to the firm.

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Teknomar has selected concept three at the end of Preliminary Design Phase. In the second phase, the Design Stage, SANTUM detailed the concept three. This phase was mostly technical yet the design process was focusing and aiming to fix the concept three according to the production capability of Teknomar and its subcontractor. The main motivation at this design stage was to enhance profitability by developing design for efficient manufacture. This is quite a common approach to placing design expertise in the Turkish SMEs, as they see design as a cosmetic touch that should not increase the previous costs and can be produced by decorous methods. In this stage, progress on the project depends on the technical approval of the subcontractor's who will produce parts without excessive investment costs.

In the last stage, the Construction Documents is about creating final CAD/CAM data for engineering and manufacturing. The true fact is that the most of the Turkish SMEs expect expertise on CAD/CAM processes due to facilitate proper communication between their engineering function and subcontractor with design firms. Therefore, design firms are encouraged being close to the in-house production team or subcontractor. On the other hand, designers who do not have enough technical knowledge are perceived as artists. Obviously SMEs prefer entrepreneurial designers who design as well as exploit the commercial potential of the product by organizing production. Design entrepreneurship (Vienne, 2002; Heller and Talarico, 2008) is perceived by SMEs as creating business and new opportunities in market by the help of design and design firms. In short, Turkish SMEs are searching design partners whose skills are not limited with conventional ones as idea generation or CAD drawing but skill for today's modern entrepreneurial and knowledge-based economy like high level of executive responsibility, business planning and management for creative and marketing issues and mostly production.

6. Some Core Points to Work with Turkish Medical SMEs

Regarding the context specific nature of design collaboration projects some characteristics of Turkish SMEs (mainly the ones in OSTIM Medical Cluster) and their way of looking to design issues are generalized as follows;

- As the SMEs operate in clusters, word- of mouth advertising is important. If one has gained success with design, others tend to imitate successful one in the search of routine (Nelson and Winter, 1982).
- As the medical device sector is highly depends on technical innovation, most SMEs prefer to work with design entrepreneurs rather than high-profile trendy ones driven by artistic motives.
- Both production and transaction costs and the manufacturing capabilities of the SMEs define the scope of design. Design is rather perceived as a cosmetic touch to an existing firm's product.
- Most of the SMEs in medical device sector are family business. When the family business is basically owned and operated by one person; the boss and usually chairman of the board; decisions on design alternatives are made by the personal taste of the boss.
- In evaluation of design alternatives, most of Turkish SMEs want to choose the best suitable one from exceedingly numbers of proposed design alternatives or deliberate or defer making a decision due to the vacillate.
- Most of the domestic SMEs search for design consultant during a term of crisis with the hope of quick fix for their immediate problems.
- The performance of regional economies is strongly influenced by the strength of local clusters and the vitality and plurality of innovation (Porter, 2003). Being in the same Medical SME cluster gives chance for to benefit from active government assistance, to lobby and to excite the designers' interest.
- Trust relationships are necessary to the conduct of business with Turkish SMEs. Some base level of trust is required just to engage for design contracts. The trust creation process, a process model of trust creation through personal interaction—mainly conversations (Maister, Green and Galford, 2001), is needed to build long-term design partnerships.

7. Conclusion

Small and medium-sized enterprises (SMEs) play a very important role in Turkish economy. They are under great pressure for being global and competitive. To eliminate this pressure most of the SMEs are congregate under sectoral clusters to facilitate continual innovation. One fruitful sample is OSTIM Medical Industry Cluster with the goals of increasing the share of domestic production in Medical Sector need and introducing OSTIM SMEs in the international medical market.

As the medical device sector is highly innovative and under the pressure of cost-containment policies, even global brands are losing ground to entrepreneur SMEs who are as effective as other giants in the market. On the other hand, SMEs have some series of weaknesses due to their scale. One weakness is lack of consciousness of design and lack of capital for innovation. Turkish medical device SME, mainly located in OSTIM, Ankara, suffer the same weakness, but attempt to seek a solution for this problem. Many domestic SMEs are trying to become more visible in the market by integrating industrial design processes. This new experience of the SMEs brings many challenges. To work with a small scaled firm forces designers to a new way of thinking. If the subject is medical device design, technical requirements in the job makes the process more complicated for the both side. This study focused on the product development challenges in SMEs and aimed to anticipate both sides overcome these challenges.

References

- Alaszewski, A.M. (2010). Using diaries for social research, *Social Research Update*, 30 (2), 1-6.
- Aydın, O. (2011). Welcome to OSTIM, *OSTIM Medical Industry Catalogue*, 1
- Cawood, G. (1997). Design innovation and culture in SMEs, *Design Management Journal*, 8: (4), 66-70.
- Dahl, D., Moreau, P., (2002). The influence and value of analogical thinking during new product ideation, *Journal of Marketing Research*, 39 :(1), 47-60.
- European Commission. (2004). *2004 Regular Report on Turkey's progress towards accession*, 2004. Brussels, Commission of the European Communities.
- Gorb, P. and Dumas, A. (1987). Silent design, *Design Studies*, 8: (3), 150-156.
- Hausman, A. (2005). Innovativeness among small businesses: theory and propositions for future research, *Industrial Marketing Management*, 34: (8), 773-782.
- Heller, S. and Talarico, L. (2008). The Design Entrepreneur: turning graphic design into goods that sell. Massachusetts: Quayside Publishing Group.
- Kaufmann, A. and Todtling, F. (2002). How effective is innovation support for SMEs? An analysis of the region of upper Austria. *Technovation*, 22, 147-159.
- Lall, S. (1992). Technological Capabilities and Industrialization. *World Development* , 20: (2), 165-186.
- Lam, A. (2000). Tacit knowledge, organizational learning and social institutions. *Organization Studies*, 21: (3), 487-513.
- Maister, D.H., Green, C. H. and Galford, R.M. (2001) *The trusted advisor*, New York: Simon & Schuster Inc.
- Mercer, F. A. (1947). *The industrial design consultant: who he is and what he does*. London: The Banyard Press.
- Nelson, R.R. and Winter, S.G. (1982). An evolutionary theory of economic change Cambridge: Harvard University Press.
- Napier, G., Serger, S.S. and Hansson, E.W. (2004). Strengthening innovation and technology policies for SME development in Turkey. Malmö: International Organization for Knowledge Economy and Enterprise Development.
- Norman, D. A. (1998). *The design of everyday things*. Massachusetts: MIT Press.
- OSTIM (2011). *OSTIM medical industry catalogue*. Ankara: Özyurt Matbaacılık.
- Plummer, K. (2001). *Documents of life*, London: Sage Publications.
- Porter, M.E. (1990). *The competitive advantage of nations*. New York: Free Press.
- Porter, M.E. (1998). Clusters and new economics of competition, *Harvard Business Review*, November-December, 77-90.
- Porter, M.E. (2003). The economic performance of regions, *Regional Studies*, 37: (6-7).
- Press, M. and Cooper, R. (2003). The Design Experience, the role of design and designers in the twenty first century. Aldershot: Ashgate.
- Rochford, L. and Rudelius, W. (1997). New product development process stages and successes in the medical products industry, *Industrial Marketing Management*, 26, 67-84.
- Schneider, B. (2004). *The successful management of small and middle-sized enterprises in a specific sector*. München: Reiner Hampp Verlag.
- Schumpeter, J.A. (1934). *The theory of economic development*. Cambridge: Harvard University Press.
- Taymaz, E. (1997). *Small and medium-sized industry in Turkey*, Ankara: State Institute of Statistics.
- Vienne, V. (2002). The education of a Design Entrepreneur. In S. Heller (Eds.), Education of a Design Entrepreneur (pp.4-8). New York: Allworth Press.
- Young, C. and Sandhu, J. (1995). An examination of British assistive technology SMEs and their potential within the single European market. In Porrero, I. P. and Bellacasa R. P. (Eds.), The European context for assistive technology. Amsterdam: IOS Press.