Proceedings of TMCE 2016, May 9-13, 2016, Aix-en-Provence, France, edited by I. Horváth, J.-P Pernot, Z. Rusák.

IDENTIFYING DESIGN REQUIREMENTS FOR EMERGING MARKETS: A STUDY ON DANISH INDUSTRY

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ABSTRACT

The manufacturing industry's interest in emerging markets has been increasing dramatically during the recent decades as their economy is growing. Western companies are making efforts to develop products for emerging markets but are also facing various challenges in the process of doing so. One major challenge is the identification of reliable and valuable design requirements. This study aims at investigating the influence of the emerging market context on the practice of identifying design requirements. A survey among Danish industry was conducted with 130 responses collected. 92 answers provided an insight into design requirement identification in a western context, whereas 62 provided an insight into both emerging and western contexts. The results indicate the importance of design requirement identification when developing for emerging markets. Requirement elicitation and analysis are the most challenging phases in a design requirement identification process for both western and emerging markets. For Danish companies, identifying design requirements for emerging markets is more difficult than that for western markets, particularly when considering user needs, governmental regulations and organizational infrastructures.

KEYWORDS

Product development, design requirements, requirement identification, emerging markets, Danish industry

1. INTRODUCTION

In the past decades, western companies have increasingly turned their focus on emerging markets. This shift has had a considerable impact on the product development process as the emerging market context often demands changes in the way of working in a company. Emerging markets have different social, cultural, political and economic contexts when compared to western markets, which are known as developed markets or advanced markets [1]. These differences make it difficult for western companies to identify reliable and valuable requirements when developing for emerging markets, and challenge the direct applicability of the conventional practices that western companies use in their home markets.

Several existing studies have addressed product development for emerging markets from various perspectives. For example, product development for the base of the pyramid (BoP) [2], frugal innovation [3] and Jugaad innovation [4] support companies to develop suitable products with restraint resources; and reverse innovation [5] focuses on bringing the knowledge developed in emerging markets back to western markets. In those studies, seizing the local market opportunities and understanding the local needs and distinctive requirements are highlighted. This awareness of the significance and challenge of understanding market needs and requirements indicates the importance of requirement identification when developing for emerging markets.

From a product development perspective, discovering and identifying requirements are often the initial and critical steps of a product development process.

Design requirements coordinate diverse needs that originate from various sources, and form the basis for synthesizing a solution [6]. Deficiencies in the defined requirements can lead to the waste of resources and even to project failure [7]. Reliable and valuable requirements function as a tool to keep product development on track in terms of being able to guide and control that product development leads to the right products and effort is allocated to the right directions. They also function as an explicit reference for all stakeholders in a product development project in order to be able to negotiate, guide and check what a team should be developing all along the product development process.

Most traditional methods and tools for identifying design requirements have been developed and tested in a western context. Facts show that how to handle the differences in identifying design requirements between emerging markets and western markets is still problematic for many companies. It is necessary to study the design requirement identification for the new context of emerging markets. Hence, this study aims at investigating how the context of emerging markets influences the practice of product development, particularly on design requirement identification in western companies. In order to do so, a survey study was conducted in the Danish industry.

This paper is structured as follows: section 2 reviews the relevant literature. Section 3 describes the research approach. Section 4 presents the results and analysis. Section 5 discusses the findings. Section 6 concludes the paper and proposes for future studies.

2. LITERATURE REVIEW

This section presents the reviewed literature from two aspects: Section 2.1 introduces emerging markets from a product development perspective. A large portion of the investigations and discussions on emerging markets are in such fields as management, business, marketing and economics. Few studies have been found that address the issue from an engineering design perspective. Section 2.2 presents relevant literature on design requirement identification. Relevant studies from the engineering design field, as well as from requirement engineering in software engineering and system engineering are included. Finally, section 2.3 summarizes the gaps in the literature and specifies the research questions for this study.

2.1. Characterising emerging markets

According to Hoskisson et al. [8], Emerging markets are 'low-income, rapid-growth countries using economic liberalization as their primary engine of growth'. They are distinguished from both developed markets and other developing countries with the characteristics of rapid economic growth, and achieved substantial industrialization and modernization [9]. For instance, the BRICS countries (Brazil, Russia, India, China and South Africa) are the most often recognized and mentioned emerging markets. Based on the literature, five characteristics of emerging markets that influence product development are identified.

Growing potential and opportunities

The fast economic growth distinguishes emerging markets from any other markets and enables them to stand out and attract increasing attention from the world's industry [8, 10, 11]. The gross domestic product of emerging markets is estimated to permanently surpass that of all advanced markets by 2035 [12].

Distinctive and heterogeneous markets

In spite of the impressive growth, the income level in general in emerging markets is still much lower than that in developed countries [10, 13], which limits customers' purchasing power and shapes their behaviours.

In addition, users and customers in emerging markets may have complete different needs and interpretations of products compared to western customers, due to their cultural, social and economic background. The differences also exist within an emerging country, e.g. from eastern China to western China, which makes the market fragmented [13].

Underdeveloped regulatory environment

The regulatory environment of emerging markets, which companies are exposed to, is considered as unstable and underdeveloped. It influences the market regulation, product regulation, governance transparency, and eventually have an impact on a company's ability to earn profits [1].

Severe competition

Western companies in emerging markets are competing with both a huge number of local and international competitors [9, 10]. Moreover, the relatively poorer IP rights protection and other consequences of the underdeveloped regulatory

environment can make the competition even more chaotic.

Inadequate infrastructures and resources

The physical infrastructures in emerging markets are often weak and underdeveloped [13] and the resources are more restraint compared to that in developed countries. For instance, the technology is often less mature and less invested in emerging markets [11, 13].

2.2. Design requirement identification

Acquiring information and transforming it to well-defined requirements require many resources and much effort. It is a time-consuming and error-prone process [14]. Identifying requirements typically happens along a number of structured phases. The commonly mentioned phases in a requirement identification process are:

Requirement elicitation: to systemically extract the requirements from customers and other sources [14, 15].

Requirement analysis: to analyse the requirements for conflicts, overlaps, omissions, and inconsistencies [16, 17].

Requirement specification: to specify explicit and formal requirements for development and evaluation use [18].

Requirement validation: to validate whether requirements are consistent with stakeholders' intention [19].

Requirement maintenance: to update, maintain and support the evolution of requirements [20].

Requirements build a bridge from the individual stakeholder's needs (the user domain) to the issues that have to be considered throughout the design process (the product domain). For instance, Pugh [21] listed 32 issues that needed to be considered when developing a product specification. Ahmed [22] identified four classes of issues that designers must consider whist carrying out the design process: the lifecycle of the product, the environment of the product and interfaces, the functional requirements, and the characteristics of the product.

In requirement engineering, the notion of viewpoint is introduced as 'a way of collecting and organizing a set of requirements from a group of stakeholders who have something in common' [23]. Each issue which is considered in the product development process can be identified from multiple viewpoints. Figure 1 illustrates an example of the relationship between the viewpoints and issues in design requirement identification.

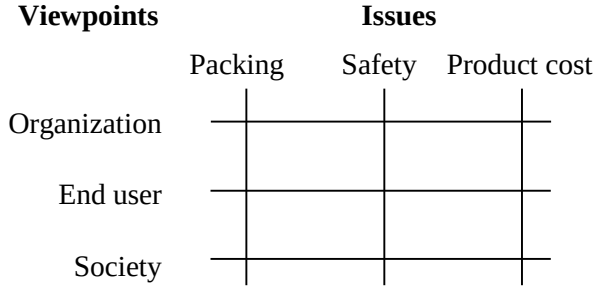

Figure 1 The relationship between viewpoints and issues in design requirement identification (adapted from [23])

In this paper, the concept of viewpoint is extended beyond the human stakeholders by including the non-human sources for design requirements, e.g. project reports and existing products. In the process of identifying design requirements, not only the technical issues of the product itself should be considered but also the socio-cultural context where the product will be immersed should be included [2]. This is particularly true when developing for emerging markets due to the gaps in the external environment. Li et al. [24] summarized seven viewpoints that should be covered in the process of design requirement identification when developing for emerging markets:

User: all relevant units that buy or use the products, e.g. end users and customers (see e.g. [25, 26, 27]).

Corporation: the company's own competencies, processes, guidelines, policies and strategies (see e.g. [25, 26, 28]).

Competition: the competition in the market (see e.g. [29, 30]).

Regional infrastructure: the infrastructures that are needed to support products to work, e.g. physical facilities (see e.g. [31, 32]).

Technology: scientific and engineering laws and principles (see e.g. [29, 33]).

Regulation: governmental regulations, and international and regional standards (see e.g. [26, 30, 31]).

Organizational infrastructure: the stakeholders involved in the product development that are external to the company, e.g. suppliers and distributors (see e.g. [25]).

2.3. Research questions

Two gaps in the literature are identified. First is the lack of research studies on examining the conventional product development and requirement identification theories and methods under the context of the rise of emerging markets. Secondly, a large number of the existing studies focus on customer requirements such as the elicitation or transformation of the customer requirements (e.g. quality function employment [34]), but a comprehensive overview of other viewpoints in requirements (e.g. corporation and regulation) is still missing.

Hence, concerning both the literature reviewed and the challenges in practice, two research questions are formulated to guide the study:

- *How is the practice of developing for emerging markets in western companies different from that for western markets in terms of identifying design requirements?*

- *How can western companies improve their practice of identifying design requirements for emerging markets?*

3. RESEARCH METHODS

In order to answer the research questions, a survey study was conducted. Denmark was chosen to represent the western context in this study due to 1) the information accessibility since the authors are based in Denmark; 2) Danish companies are also facing the challenges of identifying design requirements for emerging markets as other western companies. This section describes how the survey was conducted and the collected sample.

3.1. Survey instruments

The survey was designed to investigate the product development practice in Danish companies when developing for emerging markets and Danish industrial practitioners' opinions on emerging markets. The seven predefined viewpoints as described in section 2, namely user, corporation, competition, regional infrastructure, technology, regulation and organizational infrastructure, were used as a reference in the survey. The survey was tested and revised in a workshop with over 20 industrial participants in Denmark. The survey consisted of four parts:

1. Background information about the company:
- Company name, size, and industry sector
- Typical project length and budget
- Business status in emerging markets

2. Background information about the participant:
- Position, background, experience

3. Design requirement identification in general and for Danish market:
- Time spent on identifying requirements in general
- The contribution of each defined viewpoint to the final set of design requirements
- The difficulty level of identifying design requirements from each defined viewpoint for Danish market
- The difficulty level of each phase in a design requirement process for Danish market

4. The understanding of emerging markets and design requirement identification for emerging markets:
- The influence of emerging markets' characteristics on product development
- Key barriers when developing for emerging markets
- The difficulty level of identifying design requirements from each defined viewpoint for emerging markets
- The difficulty level of each phase in a design requirement process for emerging markets
- General opinions on product development for emerging markets

3.2. Sampling process

An initial list with 7723 Danish companies was extracted from a professional online business database called *Bisnode*. Those companies all:
- operated in Denmark;
- developed or manufactured products, or provided product design services to other companies;
- and were making profit.

A link to the survey was sent to the companies on the list by an email research invitation. Two screening questions were added in the email to select relevant companies that:
- have experience with emerging markets;
- or have potential interest in selling to emerging markets.

3.3. Sample description

A total of 131 respondents answered the survey. One response was deleted due to clearly invalid answers. The remaining 130 answers represented 125 different companies. Not all respondents completed the survey.

All 130 respondents finished part 1 and part 2, which presented the basic background information and the company's business status in emerging markets. 75 (57.69%) of these 130 respondents were working in companies that were doing business in emerging markets. 92 respondents filled in part 1, part 2, and part 3, and 56 (60.87%) of them were doing business in emerging markets. Their answers provided an insight into the identification of design requirements in a western context that was represented by the Danish market. Among these 92 respondents, 65 completed all four parts, of which 45 (69.23%) were doing business in emerging markets. Their answers provided an insight into both emerging and western contexts. Table 1 presents the counts of respondents and the represented company sizes.

Table 1 Sample overview

Size (number of employees)	Total answers	Insights for Danish market	Insights for emerging markets
Large (>249)	17	13	10
Medium (50-249)	19	12	11
Small (10-49)	66	46	29
Micro (>10)	28	21	15
Total	130	92	65

The survey response rate was lower than 5%. Possible explanations for the low response rate were 1) not all the companies on the initial list passed the two screening questions, 2) the email addresses generated from the database and used to contact companies were often general email addresses (e.g. information or customer service) and not always up to date.

Among the 130 respondents, 89 were the business owners or from the top management team, 21 were managers, while 10 were from other positions, e.g. engineers and sales. 68 respondents have a background of engineering, 47 have a business background, and 47 have a management background (multiple choices allowed).

4. RESULTS

This section presents the analyzed results from the survey study, and the results are discussed in section 5.

4.1. Differentiating for emerging markets

66 respondents in the survey study described the business status of their companies in emerging markets. 11 (16.7%) companies were developing new products for emerging markets. 19 (28.8%) companies were adapting existing products for emerging markets (with some changes in the design). 36 (54.5%) of the companies were selling existing products (without any changes in the design) to emerging markets.

Another reports gained similar results when investigating the western companies' business statuses in several emerging markets [35], which corroborates the results of this study, see Table 2. It provided an extended view from the Danish industry to a broader range of companies all over the world, and specified data for each emerging market. In addition, these results verified the representativeness of the sample.

Table 2 How are the products sold by companies in emerging markets compared to products sold in home markets (adapted from [35])

Emerging market	Very different	Somewhat different	Very similar
Indonesia	12%	41%	47%
India	16%	32%	52%
Russia	11%	43%	46%
China	14%	36%	50%

65 respondents commented on the necessity of differentiating products for emerging markets. 29 (44.6%) respondents agreed that there was a need to differentiate products sold to emerging markets from that sold to Danish market. 20 (30.8%) stood neutral and 16 (24.6%) disagreed.

About half of the surveyed companies were already either adapting existing products or developing new products for emerging markets and close to half of the respondents thought it was necessary to differentiate products for emerging markets. The necessity of differentiating and redeveloping products for emerging markets requires understanding of the different local needs and requirements, and the adjustment of the supportive processes, methods and tools for the new context [36].

This concern was also reflected in the key challenges faced by companies when developing for emerging markets. In the survey, respondents were asked to choose the three most difficult challenges from a list

made upon literature review and a workshop. Table 3 listed the challenges and counts of answers.

The top challenges on the list implied the insufficient understanding about the requirements and needs in the local market and the socio-cultural context. Specially, they reflected the difficulty in identifying design requirement from the viewpoints of regulation and user. It, on the other hand, confirmed the need and significance of studying design requirement identification for emerging markets.

Table 3 Key challenges faced by Danish companies when developing for emerging markets

Challenges	Answers	Percent n=65
Difficult to reach and understand the local regulation and to get local approvals	28	43%
Different business culture of deeply embedded networks and personalised exchange	27	42%
Insufficient understanding of market needs	24	37%
Unstable political and regulatory environment	22	34%
The shortage of financial support	21	32%
Difficult to develop affordable products with sufficient features for local consumers	16	25%
Poor intellectual property right protection	15	23%
Special constraints under the using context, e.g. a lack of supportive infrastructure and space	12	18%
Difficult to overcome the impediments to distribute	11	17%
High level of product diversion within or between countries	8	12%
Possibility of watering down a premium brand	4	6%
Language, distance, and time zones	2	3%

4.2. Comparing design requirement identification for Danish market and emerging markets

65 respondents expressed their opinion on whether it is more challenging to identify design requirements for emerging markets than for that Danish market (or western markets). 41 (63.1%) supported that it was more challenging for emerging markets; 16 (24.6%) were neutral; and only 8 (12.3%) were against it.

In order to further understand how the design requirement identification for emerging markets are different from that for western markets, the authors compared the design requirement identification practice for the two contexts from two aspects: 1) the phases in a design requirement identification process, 2) the viewpoints of design requirements.

Requirement identification phases

Respondents were asked to rank the five design requirement phases (elicitation, analysis, specification, validation and maintenance) with respect to how challenging they were in the process. The ranking was done separately for Danish market and emerging markets.

The ranking of each phase was coded with the value that equal to its rank. For instance, if requirement elicitation was ranked as the second most difficult, it would be coded as 2 in the analysis. A non-parametric Friedman test of the differences among the ranking of each phase was conducted respectively for Danish market and emerging markets. Friedman test is used to detect the differences between groups when the dependent variable is ordinal. For Danish market (n=92), the test rendered a Chi-square (χ^2) value of 72.57, which was significant (p=.000), while for emerging markets (n=65), the Chi-square (χ^2) value was 24.78, which was also significant (p=.000). The mean ranks and the values in the 25th, 50th (median) and 75th percentile of each phase is showed in Table 4. Here lower means indicated higher difficulty levels of the phase.

The results showed that for both western and emerging contexts, requirement elicitation and analysis were the two most difficult phases in a design requirement identification process. Particularly, in emerging markets, requirement elicitation was ranked as the most difficult phase.

Table 4 Descriptive statistics of the ranking of five phases in a design requirement identification process

Phase	Mean rank	Percentiles		
		25th	50th (Median)	75th
Danish market(n=92)				
Elicitation	2.50	1	2	4
Analysis	2.25	1	2	3
Specification	2.98	2	3	4
Validation	3.22	3	3	4
Maintenance	4.05	3	5	5
Emerging markets (n=65)				
Elicitation	2.38	1	2	4
Analysis	2.62	2	2	3
Specification	3.51	2.5	4	5
Validation	3.09	2	3	4
Maintenance	3.40	2	4	5

Post hoc comparisons using the Wilcoxon signed-rank test were conducted to check the where the differences actually occur.

The results showed that the difficulty level of requirement elicitation was not significant different from requirement analysis in both Danish market and emerging markets contexts. In Danish market, both requirement elicitation and analysis were found significantly more difficult than the rest three phases: requirement specification, validation and maintenance. The Z values and p values are presented in Table 5.

Table 5 Post hoc test of the difficulty differences between phases in Danish market (only the results for requirement elicitation and analysis were showed)

Phase	Compared phase	Z	p
Elicitation	Analysis	-1.01[a]	.314
	Specification	-2.14[b]	.032*
	Validation	-3.14[b]	.002**
	Maintenance	-5.54[b]	.000***
Analysis	Specification	-3.30[b]	.001**
	Validation	-4.43[b]	.000***
	Maintenance	-6.63[b]	.000***

a. Based on positive ranks.

b. Based on negative ranks.

* p < .05, **p < .01, ***p < .001

In emerging markets, requirement elicitation was significantly more difficult than specification, validation and maintenance, while requirement analysis was significant more difficult than specification and maintenance. The Z values and p values are presented in Table 6.

Table 6 Post hoc test of the difficulty differences between phases in emerging markets (only results for requirement elicitation and analysis were showed)

Phase	Compared with	Z	p
Elicitation	Analysis	-.86[a]	.389
	Specification	-3.55[a]	.000***
	Validation	-2.43[a]	.015*
	Maintenance	-3.19[a]	.001**
Analysis	Specification	-3.20[a]	.001**
	Validation	-1.92[a]	.055
	Maintenance	-3.00[a]	.003**

a. Based on negative ranks.

* p < .05, **p < .01, ***p < .001

Viewpoints in design requirements

To explore how design requirement identification is different from western markets to emerging markets from various perspectives, respondents were asked to rate how difficult it was to identify design requirements considering each viewpoint when developing for Danish market and for emerging markets respectively. The difficulty level of each viewpoint was rated by the respondents on a 5 point Likert scale from 1 (not at all difficult) to 5 (extremely difficult). The means (M) and standard deviations (SD) of the ratings were presented in Table 7.

Table 7 Descriptive statistics of the difficulty level of identifying design requirements considering each viewpoint

Viewpoint	Danish market (n=90)		Emerging markets(n=64)	
	M	SD	M	SD
User	2.29	.95	2.86	1.08
Corporation	2.08	.92	2.42	.92
Competition	2.39	.99	2.83	.97
Regional infrastructure	1.81	1.03	2.28	.86
Technology	2.38	.96	2.37	.93
Regulation	2.37	1.03	2.98	1.08
Organizational infrastructure	2.17	.90	2.76	.85
Average of all viewpoints	2.21	.67	2.64	.64

Friedman tests showed that the differences among the seven viewpoints were significant in both Danish market [χ^2 (6) =38.96, p=.000] and emerging markets [χ^2 (6) =45.15, p=.000]. The medians are reported in Table 8.

Table 8 Value of difficulty level for each viewpoint in the 25th, 50th (median) and 75th percentile when developing for Danish market and for emerging markets

Viewpoint	Danish market (n=90)			Emerging markets(n=64)		
	25th	50th	75th	25th	50th	75th
User	1	2	3	2	3	4
Corporation	1	2	3	2	3	3
Competition	2	2	3	2	3	3
Regional infrastructure	1	1	3	2	2	3
Technology	2	3	3	2	2	3
Regulation	2	2	3	2	3	4
Organizational infrastructure	1	2	3	2	3	3

The top three difficult viewpoints in Danish market were competition, technology and regulation, followed by user, organizational infrastructure, corporation, and regional infrastructure. And the gap between regulation and user was significant tested by a Wilcoxon signed-rank test, Z = -6.19, p=.000. And in emerging markets, the top four difficult ones in were regulation, user, competition and organizational infrastructure. The gap was not significant between competition and organizational infrastructure [Z = -.81, p=.416], but was significant between organizational infrastructure and corporation [Z = -2.57, p=.010].

A paired sample t-test was conducted to compare the differences between the two contexts. Table 9 displays the compared means (equal to values in Danish market minus values in emerging markets) and p values. The bigger absolute values of the compared means indicated larger differences between the contexts of developing for Danish market and for emerging markets.

The average mean of all viewpoint, in terms of how difficulty it was to identify design requirements from for emerging markets, was significantly higher than the average mean for Danish market. Six viewpoints (user, corporation, competition, regional infrastructure, regulation, and organizational infrastructure) were rated significantly more challenging when developing for emerging markets than for Danish market. No significant difference was found in technical viewpoint between the two contexts. The difficulty level dramatically increased from developing for Danish market to developing for emerging markets for three viewpoints: organizational infrastructure, regulation and user.

Table 9 Comparing the viewpoints in design requirement identification between developing for Danish market and for emerging markets (n=61)

Viewpoint	Compared means	SD	p (2-tailed)
User	-.53	1.18	.001**
Corporation	-.37	1.18	.016*
Competition	-.32	1.14	.030*
Regional infrastructure	-.389	1.12	.009**
Technology	.02	1.08	.907
Regulation	-.60	1.21	.000***
Organisational infrastructure	-.65	1.14	.000***
Average of all viewpoints	-.41	.77	.000***

* p < .05, **p < .01, ***p < .001

5. DISCUSSION

The study implies the importance of making efforts on design requirement identification when targeting the new context of emerging markets. Two reasons revealed by the results are discussed here.

First is the need of differentiating products for emerging markets. The results show the fact that roughly half of the western companies are either adapting existing products or developing new products for emerging market, and almost half of the respondents were positive about the differentiation. Moreover, research studies support that products sold to emerging markets should be redesigned or adapted for the local context. A couple of studies have found that the conditions especially the local market needs in emerging markets are very different from a western market [37], e.g. the lower income level and local frugal competitors' products affect users' behaviours. The existing products developed for western customers do not necessarily satisfy the customers in emerging markets. And it costs less for western companies to learn emerging markets and adapt their products for them than to change the markets or to educate the customers to accept the offered products [37-40]. This need of differentiating products for emerging markets calls for new processes and

methods to identify design requirements that are suitable for the new context [36].

Second, the challenges western companies are facing in emerging markets are connected with design requirement identification. The top three key challenges defined in this study can be interpreted as a lack of knowledge about the local regulations, business cultures and market needs. Particularly, regulations and market needs contribute to considerable amount of design requirements [41]. Facing those challenges indicates that western companies may have problems of identifying reliable and valuable design requirements or even be using inappropriate design requirements.

In addition, the study points out potential directions of where the efforts should be made on identifying design requirements when developing for emerging markets.

Firstly, requirement elicitation and analysis are found as the most challenging phases in a design requirement identification process. Particularly, requirement elicitation is challenging when developing for emerging markets. These two phases involve interaction with a number of external factors, which requires that a company to have not only professional knowledge to interpret and understand the market but also suitable approaches and adequate resources to gather sufficient information. This is particularly demanding for western companies in emerging markets because of 1) the complexity of accessing to information; 2) the lingual, social and cultural gaps that block the information communication and understanding.

Secondly, the study assesses seven viewpoints in design requirement identification and compares them between the western and emerging contexts. The results suggest that 1) the new context of emerging markets increases the difficulty level of identifying design requirements; 2) some viewpoints are influenced more by the shifting of the context than others. The seven viewpoints are hence be grouped into three categories based on their market-dependence:

Highly market-dependent viewpoint: a viewpoint in design requirement identification that highly depends on the target market. The requirements proposed from the viewpoints vary to a great extent from market to market. In this case, the highly market-dependent viewpoints are organizational infrastructure, regulation and user. Both regulations and users are context-dependent entities. Governmental regulations and regional standards are normally formulated by the local authorities and often different from place to place. Users are affected by the social and physical surroundings, and they perceive and use the products based on their own background and experience. Furthermore, when companies enter a new market, they often find new local partners, suppliers, manufacturers, or distributors. Those new organisational infrastructures on one hand contribute with their experience and understanding of the market, but on the other hand it increases the complexity of information gathering.

Slightly market-dependent viewpoint: a viewpoint in design requirement identification that depends on the target market but to a small extent. The requirements from those viewpoints can be different from market to market. In this case, the slightly market-dependent viewpoints are regional infrastructure, corporation, and competition. The regional infrastructures such as the power supply and internet access, are crucial in many cases to enable the use of a product, and they are particularly critical in the undeveloped areas. Corporates can modify their strategies or propose new strategies in the new markets which can be reflected on the product design. The competitors in the new market both local and international can have different features from those in a company's established market and hence results in changes in the design in order to compete with them.

Market independent viewpoint: a viewpoint in design requirement identification that does not depend on the target market. The requirements from those viewpoints remains the same or only be influenced limitedly by the target market. In this case, the market-independent viewpoint is technology. In most of the Danish companies, technology is considered as an internal competency. They often develop technology back home and utilise in other markets, hence it is limitedly influenced by new markets.

For specific cases, the market-dependence of each viewpoint can be different. For example, companies that develop products for a very niche market are competing with almost the same competitors all over the world. Changing the market does not changes much of the competition for them compared with other industries. Defining the market-dependence of each viewpoint can increase companies' awareness of the consequential changes when entering emerging markets.

Two viewpoints in design requirement, namely user and regulation are emphasized in this study due to 1) the highly increased relative difficulty level from western market to emerging markets; 2) the reflection to the highlighted key challenges. In addition, previous study indicate that user viewpoint contributes the most to the final design requirement set in terms of the number of requirements, followed by regulation and technology [41]. Hence, companies are suggested to focus their attention and effort to these two aspects when identifying design requirements for emerging markets.

The study also implies the challenges of identifying design requirements from regulations may be overlooked. Limited methods have been developed to support the design requirement identification from the regulatory viewpoint, which is probably due to the impression that regulations are normally well-documented, easy-accessed and context-dependent [42]. However, in the survey, respondents regarded the regulatory viewpoint as problematic to design requirements in both western and emerging contexts, particularly in the emerging context. Thus, it is necessary to revaluate the regulation's role in design requirement identification and develop necessary supports.

6. CONCLUSION AND FUTURE RESEARCH

This study investigates the design requirement identification practice in western companies under the context of developing for emerging markets. Relevant literature about product development for emerging markets from different fields, e.g. business, management, and design were reviewed. Empirical data were collected from a survey study conducted in Danish industry.

The study examines the differences between identifying design requirements for western market and emerging markets from two aspects: the process of design requirement identification and the viewpoints in requirement identification. The results highlighted the challenges that the industry is facing and the necessity of improving the theoretical understanding and supporting on design requirement identification for emerging markets. For the industry, the study indicates that western companies should focus their effort on identifying design requirements when developing for emerging markets, especially considering user needs and regulations.

The study is limited by its sample size and the representativeness of the Danish industry. The results would be generalizable if the study is extended to a larger sample and to other western countries.

Three potential topics are proposed for future studies. First is to deeply understand the reasons behind those challenges when companies developing for emerging markets and to understand companies' decisions in emerging markets, e.g. why sell existing products or adapt products. Second is to compare the differences and commonalities of product development for emerging markets between western companies and the local companies in emerging markets, and the possible learning from each other. Thirdly, by combining the first two points, supportive design methods or tools are needed to guide companies' practice in emerging markets. The majority of existing discussions on product development for emerging markets e.g. frugal innovation, are in such fields as innovation management and business. At the same time, design studies should follow up the trend and provide sufficient supports to facilitate the unique design tasks emerged under this specific context.

ACKNOWLEDGMENTS

The authors acknowledge the Global opportunities for Danish SMEs in Emerging Markets (GODS for EMs) project (funded by Industriens Fond) for supporting this research and thank the participants of the survey.

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