

# **FRAMEWORK TO IMPLEMENT CUSTOMER DRIVEN PRODUCT DEVELOPMENT APPROACH FOR SRI LANKAN FURNITURE DESIGN INDUSTRY**

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Degree of Master of Science in Project Management

Department of Building Economics

University of Moratuwa  
Sri Lanka

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Dissertation submitted in partial fulfillment of the requirement for the  
Degree of Master of Science in Project Management

Department of Building Economics

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Sri Lanka

December 2014

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Archd. Ravihansa Chandrathilake

Date

Dissertation Supervisor

# ABSTRACT

## **Framework to Implement Customer Driven Product Development Approach for Sri Lankan Furniture Design Industry**

There are two major management approaches in the global product development industry: top-down and bottom-up. There is a product development approach called, “New Product Development”. This new bottom-up approach is already practiced in most developed countries. The elementary approach of this system is based on customer integration to product development. The involvement on the process has not been specified. But customers can involve throughout the design to implementation stages.

There is another approach called customer driven approach, which takes place among internet communities. Those are called “virtual communities”. In those virtual communities, people gather all over the world. They share the knowledge, giving their ideas and comment on improvements. However, there is only few people from a Sri Lankan base can be seen in those gathering platforms. So, there is a need to identify this gap prior to introduce those new methodologies into the Sri Lankan furniture industry. There are more literature published under those specified subjects and focused on product development. Those indicate some identified barriers, risks and restrictions when implementing those new methods to different cultural contexts. Some of them have solutions and some of them not. Therefore, it is necessary to identify those critical factors related to Sri Lankan culture before implementing it to local furniture design and manufacturing industry. A properly composed framework is needed for guidance.

**Keywords :** *New Product Development, Customer Driven Product development, Virtual communities, Furniture Industry.*



## DEDICATION



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I DEDICATE THIS  
DISSERTATION TO MY  
LOVING PARENTS AND  
TEACHERS

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## LIST OF ABBREVIATIONS

|      |   |                                      |
|------|---|--------------------------------------|
| NPD  | – | New Product Development              |
| SPD  | – | Social Product Development           |
| PD   | – | Product Development                  |
| CDPD | – | Community Driven Product Development |
| VC   | – | Virtual Communities                  |
| FI   | – | Furniture Industry                   |



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## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

In the present day, product development performs a major role in furniture industry. It has been using both traditional top-down management systems and new consumer integrated product development systems widely within the furniture design industry from the past. But new approach of product innovations are targeted mostly customer oriented effective outputs. Considered worldwide, virtual communities gather to share their knowledge as an international community. These global knowledge and experiences again integrated to consumer products and came up with product differentiation with regional and cultural aspects (Chandra and Neelankavil, 2008).

A large number of new consumer products appear in the marketplace each month and each year (Xie, 2008). Zenko and Mulej (2011) describes, most innovations creates a great effect on environment and people. Not all those ideas developed by people are successful every time. Most ideas are lost in the development process. Developing product is not just simple process always. A combination of expert knowledge, suitable technologies and consumer feedback need to be gathered for successful outcome. Xie (2008) also featured that successfulness or failure has a significant financial and operational effect for the firms. When potential customers accept or buy a product and use them with new benefits will become an innovation from invention. In this way, innovation cannot be and invention until going to the consumption. In new product development, the main approach is occurred of understanding customers' wants and needs. The primary objective is to develop an understanding of users 'values and behaviours that can be translated into viable, powerful visual design, information architecture and design ideas (Moalosi, Popovic and Hudson, 2008).

In traditional product design process, designers have to be played a major role. Designers had to take into consideration the technological, aesthetic, anthropological and socio-cultural factors of their intended users (Moalosi et al., 2008). Capacity of the designer involvement is depend on the development process. Hilletofth (2011) states that, whatever the party, designer or an engineer is working as a multifunctional development team. In his view, it says that those happening structures are multifunctional teams and correctly structured and it further says that this development team is highly structured and infused with greater responsibility and authority. However, this doesn't determine that multifunctional teams are structured only for gathering in social community. Therefore, their input is major focus on design and engineering part than a consumer involvement. When external party is engaged in to the process, it becomes as a second stage of NPD by adding the inventor in to this process. Possibly the participant mainly comes from the common user's reason, therefore the related second stage of NPD main duty is to play "co-innovator" and "co-designer" role (Chu and Chan, 2009). When a consumer engages into the product development, the product attach in to social approach. Then it can be considered as foundation for new community driven product development in local and international level.



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Furniture product development is not just design and manufacturing. The processes circulate until the objective turns out to be a successful outcome. Firms are increasingly focused on the success of new and innovative products for sustainable development and earnings (Steenkamp, Hofstede and Wedel, 1999). There are different types of people are involved in this process with different philosophies, problem solving methods, researches, technical detailing, design and appearance, prototyping and pricing experiences etc... Some international companies like Nokia, Microsoft, Haier are also searching on community feedback on their product development by collecting comments and ideas through distinctive web sites. Some firms can be found totally organize on product development through community feedback using their web and blogs (eg. [www.Quirky.com](http://www.Quirky.com), [www.kickstarter.com](http://www.kickstarter.com), [www.edisonnation.com](http://www.edisonnation.com) etc...)

When consumer product development approach applies in to furniture design industry, design production processes could be deferred. But overall approach would be the same. Virtual companies like Quirky inc. and Kickstarter inc, develop furniture products using new concepts with consumer ideas and influence. In some companies like “As seen on TV”, has published their problems and issues with their product to find the better solutions from the community in web sites. (Edison Nation LLC, 2014). That is one of the advanced methods they have used to find the creativity from everywhere and if that influences work, they have guaranteed to pay a percentage of profit to the every purchase of product.

Companies like [www.quirly.com](http://www.quirly.com) already took an approach to design customer driven furniture products and storage solutions in their innovations and getting earnings for their contribution to the product development by customer driven product design solutions (quirky, inc., 2012). [www.kickstarter.com](http://www.kickstarter.com) also having several furniture design developments through customer driven approach. They experiment and develop different stackable furniture with customer driven approach (Kickstarter, inc., 2014).



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One is Industrial approach and other is Social approach. Still our culture depends on first approach and only few people try to go over the rope and do an invention. It may be an innovation or a development of existing or may be influence for a product development process. Customer support is now “being recognized as an important research priority” (Loomba, 1996).

## 1.2 Background

Innovative consumers play very important roles in the success of the new product (Goldsmith and Flynn, 1992). They may be thinkers, designers, technical experts or may be well experienced in different related industries or everyday working at office or home. Consumer support is a key element of marketing various products from simple domestic appliance to high tech computer products. By involving consumers in product design, the firm enables consumers to create their own demand (Yeh,

2010). In Sri Lankan school education and inventor associations also doing a lack of encouragement for the design and specially focusing for technical and engineering aspect. Usually in the field of interior design and architecture focusing on individual clients not the consumers. Most of design and architectural schools also for cussing on client based designs. When coming to the customer driven approaches then it goes to the mass production to cater the large scale of customer base.

The traditional top down management system is the most experienced method on product development from the start. There are several barriers and issues coursing when attempting a new approach to the existing systems. The community members and also the firms/ companies facing different cultural and regional issues when focusing their furniture products on developing countries.

Some major issues arising on Sri Lankan context with awareness problems. Less education about internet through businesses, economical restrictions on internet businesses, Intellectual property knowledge restrictions are specially matter on businesses. Cost and technology is another issue that directly seen. In Sri Lanka, cost on technology is an issue because locally have to import most materials and machinery from outside. People thinking that technology as an issue but when we think about a plastic furniture making company, some furniture design companies have technology, machinery, knowledge, materials, labour but they still manufacturing the products designed by somewhere. Some of the designs are not catering the Sri Lankan anthropometrics and ergonomics.

There are few furniture companies doing product development by community involvement in testing stages. In a product-design process, firms are generally more knowledgeable than consumers regarding possible technical solutions, as well as in maximizing effectiveness. By contrast, consumers tend to know more about their particular needs and usage situations than firms (Yeh, 2010). Social products development companies collect and develop products by community ideas and manufacture by their ability. To create helpful user experiences, designers should study users' behaviour and their actions together with products. By interacting with

users in their natural habitat, designers can uncover and gain insight into users' beliefs, behaviours, needs, perceptions, desires, and values (Moalosi, Popovic and Hudson, 2010).

Some government restrictions also effect for those problem. Island (2014) states 'Pay pal' is restricted for Sri Lankans. Most online workers' pay additional money for brokers to take their hard-earned money to Sri Lankan accounts (The Island, 2014). This kind of economically related issues discourage people involving in international businesses.

### **1.3 Problem Statement**

There are no past studies done in Sri Lanka about community driven product development and on the application of this approach to Furniture industry. Community developed products are the latest trend in new product development. However, Sri Lankan society does not have successful procedures to promote and build awareness on consumer driven approach or web bases community approach. Sri Lankan furniture design should have more attention on customizing products for local customer needs by skipping the typical traditional and contemporary design models. Therefore, furniture design industry must learn from new methods and benefits from them. Still people lack knowledge about community driven furniture products and how people can involve in developing products for their own requirements. Therefore, this gap has to be filled by implementing a well-managed consumer driven product development approach in to the current situations.

### **1.4 Aim and Objectives**

The aim is to provide a framework to explain the potential of community driven furniture product development with identified issues and defining an approach to render the furniture design field more interesting for the Sri Lankan society.

The objectives supposed to be fulfilled while carrying out this study are:

1. To study the concept of consumer based product development.

2. To identify the importance of virtual communities and their contribution to community driven product development for both consumer and production firms.
3. To identify key issues related to introducing community driven product development to developing countries.
4. To identify the awareness on community driven product development with its web based global application and practices in local Sri Lankan furniture industry.
5. To suggest framework to develop consumer driven approach and develop a model to access consumer driven furniture product development in Sri Lankan context

### 1.5 Methodology

This research will be conducted under four phases. In phase one, a background study will be carried out to establish the research problem and as well as the aims and objectives of the study.



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In the second phase, a comprehensive literature synthesis will be conducted to identify the key concepts and issues relevant to virtual communities and community product development. Further it will be identified the importance of community driven product development's key criteria and indicators to evaluate community approach for furniture product development through literature review. Accordingly, a questionnaire would be developed based on the criteria identified in the literature review and the significance of those criteria according to Sri Lankan context. A substantial data collection will conducted based on the criteria identified in the literature survey. A sample selected through the convenient sampling method with professional bodies select randomly will be used to conduct a content analysis to identify the effects behind factors.

## 1.6 Scope and Limitation

- The study will be conducted for a quick review of community driven product development by looking at the current situation.
- This study will focus on the analytical data regarding the selected web sites and randomly interview the well educated people. The feedback on general society will change according to their educational levels and income levels.
- Some past studies which have identified criteria for community product development projects were specially considered throughout this study, but the web based product development study model to be established here will be developed under the conditions of Sri Lankan context. It can be varied according to the cultural, educational, and technological excellence in different countries.
- There are some Limitations and challenges in implementing web based approaches in Sri Lankan context due to lack of knowledge about information technology and usage of internet as a communication method.

## 1.7 Chapter Breakdown

The report of this study will consist of four chapters. *Chapter one* will give an overview to the dissertation and presents the structure of the report. This will include the background review, aims and objectives, methodology, scope and limitations of the study.

*Chapter two* explores key concepts relevant to community driven product development and the importance of community driven product development in furniture design industry by using a comprehensive literature. This will explore the significance of those criteria and issues related to introduce it for developing countries.

In *chapter three*, the research methodology will be discussed. This will include the literature findings and using it for analysis, methods of data analysis and data

collected will be analysed and identify the community driven product development approach and possibilities of implementing it in Sri Lankan furniture industry.

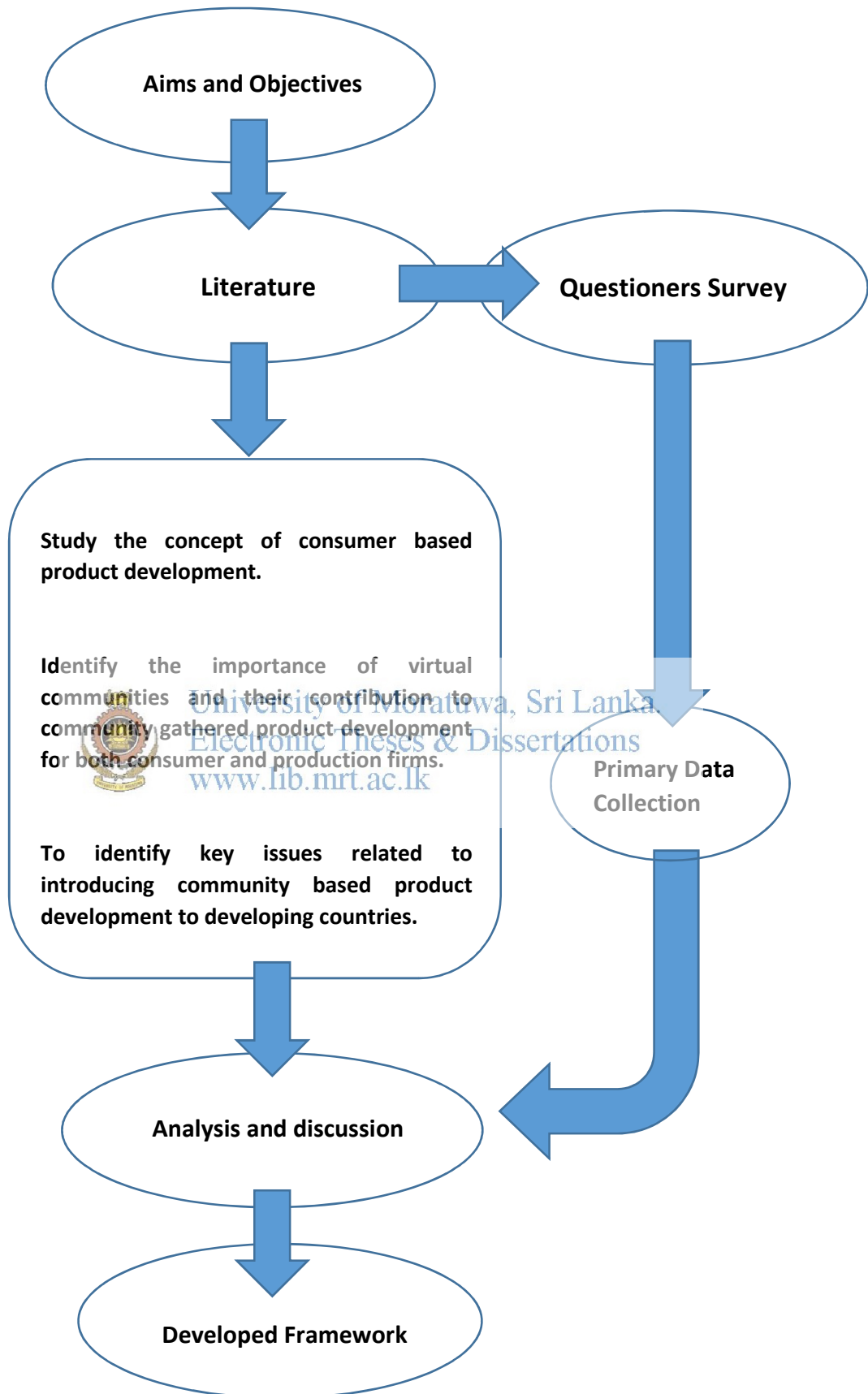
Finally, *Chapter four* will come up with the conclusion and the framework will be developed and address the further research areas that can be explored in future.

## **1.8 Summary**

As a middle-income country Sri Lanka, lacks chances to keep up with the fast growing industrial culture. That may be owing is challenges in communication, technology, facilitating or whatever other social issue. As a result, the country misses a lot of chances owing to technological, social and cost issues, which are typical to middle-income countries.

Consumers have the right to express their requirement of products. Community driven product development is one of the best approaches for the society to express their innovative ideas and experiences with the community. Inventers are not always professionals, consumers also can become an inventor. The community driven approach help this merging of roles and adding flexibility to the production process. There are a few of people, who actually benefit from it. Some of them have made community based product development a full-time profession. However, it is rarely practiced in the Sri Lankan context and especially in furniture design field. The space for growth is vast. The conceiver of an idea can be an inventor or consumer but everyone has a chance to get lifetime benefits by engaging in consumer driven product developments in furniture firms or as a virtual community.





## CHAPTER 2

### INTRODUCTION

#### 2.1 Product development approach

Top-down and bottom-up are two different approaches used in the industry with reverse directional procedure. Regularly, the established organizations come from top-down or Bottom-up innovations and each one of them have unique approaches and own set of parameters (Gaynor, 2012).

##### 2.1.1 Top-down Approach

In top-down approach, many people are in authority set places. They are with defined targets, objectives and provide the funding. The process is divided to many segments and professional disciplines. They cooperate with each other to meet the objectives. This approach direct on activities like exploring the market, reduces some segments of current products line, compete with new market products, invest on new technology and automated manufacturing (Gaynor, 2012). Furthermore, the restrictions on Top-down approach are limited human resources, funding and provided directions.

According to the top-down approach, the starting point is the authoritative decision. As the name implies, centrally located performers become visible and it is most relevant to produce the desired effect. Dealing with the way it regards as the single actor within the process is the most outstanding criticism that top-down approach has (Matland, 1995).

##### 2.1.2 Bottom-up Approach

Bottom up approach simply demonstrate as upside down of Top- Down approach. In bottom-up approach, everyone is welcome to participate. This approach provides big challenges to innovative people who think differently, who has many questions,

interests, who look for change, look in different perspectives, considered arrogant, create problem for first level managers and who ask why not more often than why (Innovation by Design, 2012). When back to the history, this is not new in to product design industry. 3M is the best example for bottom-up innovation approach for past seventy five years history. Culture provides a freedom for many activities and chances to explore new concepts and it is guided by effective operational and financial discipline. According to this approach, the administrative staff cannot claim any democratic power that allows them to decide on their own. For an example to implement an act by the elected representatives of the people (Matland, 1995)

## **2.2 The New Product Development**

Departing from the traditional “producer–producer partnership” that describes product development, involving customers in product design is a useful approach (Yeh, 2010). A newer line of theory (and a corresponding method) holds that to understand what consumers seek in products (Søndergaard and Aarhus, 2007). New product development focusing on new approach for integrating multifunctional relationship for the design development and production process. Those developed with identification of customer needs and it has become an important issue for product design. Yeh (2010) further describes, leaving the traditional “producer–producer partnership” and involve customers for product development as a useful approach.

Innovative customers seem to have a unique consumption behaviour than non-innovative customers (Foxall, 1984). Zenko and Mulej (2011) furthermore states innovators are most technically educated people and they are different from most potential users.

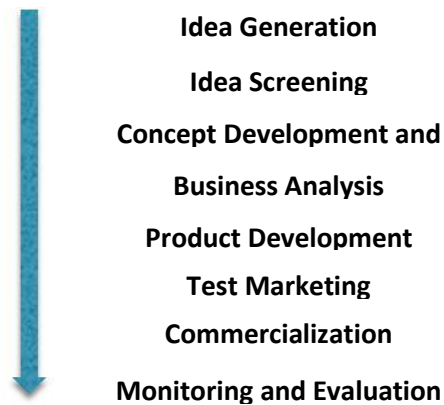


Figure 2.1: The new Product Development Process

The traditional product development process based on top-down and decomposition-base process but the mass collaborative product development is driven by principles of product evolution and self-organization. Panchal, (2009); Pitta and Fowler (2005) added more explanation with a categorization. It was categorized the product development process in to major stages Idea generation, screening, economic analysis, development, test marketing and commercialization. This categorizing is a good input for to identify the design and development stages that use in new product development and a good approach to identify the requirement of customer integration in different milestones. The object in the project creation phase is to develop customer oriented and innovative products cater on understood customer needs (Hilletoft, 2011). Zenko and Mulej (2011) defined innovation management is an ongoing activity with many people involved. This is also the same approach called mass collaborative approach. Hong, (2009) adding some further identification with involvement of firms. In this, recognized the ability of coordinating suppliers' product development on design activities as a source of competitive advantage. Many companies do not consider product support until relatively late in the development cycle (Goffin, and New, 2001).

Producers make products developed by using the gathered information by customers and make prototypes for testing. Customers can use the products and comment on the

changes. Modified products then tested and going with changes that are more successful and more time investment (Pitta and Fowler, 2005). However, Panchal (2009); Pitta and Fowler (2005) addressing the different stages of process than final stage. It is involved on total process not only testing part and before prototype part is missing. It might be useful to approach the new product development from the limitations other than directing on technology and internal resources for developing products through traditional product development process (Chandra and Neelankavil 2008). Palmer (2009) says some producer led companies love to be a part of a community.

### **2.2.1 Community driven product development**

Community gathered product development became as a need of higher market orientation in present times (Lin, 2007). Knowledge embedded in people, and knowledge embedded in a community (Wasko and Faraj, 2005). Community driven product development describes in different views. Community-based innovations aggregate the efforts of individuals to create something that serves a shared need, and explicitly includes the participation of customers' point of view (Chu and Chan, 2009). People gather around a firm and the firm will have the coordination and controlling. Customers can collaborate on ideas and adding value for the sellers output (Sashi, 2012).

“Creative methods performed in groups of specialists and they can support to develop better ideas with greater potential to develop in to inventions. On the other hand, design collaboration is a process of socializing, for which it is an opportunity for consumer product design partners to get to know each other, learn how to work together, and discover what sort of support one can garner from the other” (Ahrama, Karwowskia and Amababa, 2010)

Communities have individuals looking to gain as well as provide knowledge inside it. Usually it is measured by number of users and market share. Adopters make different groups with different characteristics; Innovators 2.5 percent, early adopters 13.5 percent, Early majority 34 percent, Late majority 34 percent, and Laggards 16

percent (Zenko and Mulej 2011). These shows the number of members in early majority and late majority is higher. There are few involvements in invention by the community and most people gathering and share their knowledge at the development stages.



Figure 2.2 : Quirky's design process

Yang (2011) described three different phases of design and development as specification, concept development and prototyping. Yeh (2010) added some more about customer knowledge, customers can be supportive and they know more about their needs than firms do. Therefore, this input from outside the firms can be more beneficial for the innovation pattern. The technical background of the firm may also have control of this “producer–consumer collaborations” in the development process. Founding the advance information on products, firms can easily backup with their internal resources with customer knowledge cooperation. Some of them allow commenting and giving feedback on their development ideas, and community offer chances to product developers and inventors to present their product concepts for sharing thoughts with the community (Pitta and Fowler, 2005). Gounaris, Dimitriadis

and Stathakopoulos (2010) stated that foundation of community based product development is dependent on knowledge sharing.

Ducati Motors, a leading manufacturer of motorcycles, created a virtual community of customers; whom it considers as fans as well, to understand customer needs, gain insights into new products and services, allow customers to share information and assist one another, and involve customers with strong relationships in product design and market testing stages of the new product development process” (Sawhney et al., 2005). Chu and Chan (2009) says, if knowledge-sharing platform comes as a public requirement, can be shared and distributed throughout a community without losing its value, and this premise supports for the rationale of knowledge sharing communities. Such virtual interest communities are based upon shared enthusiasm for an issue or an activity. They possess and exchange knowledge concerning specific product domains and often are virtual meeting places for innovative users to discuss opportunities for new products and ideas for product improvement. Chu (2009) further says, members in a community believe that contributing on a discussion or helping on a community matter and reciprocate others feedback as a duty. The presented knowledge base can consist of copied ideas or genuine innovative ideas. As a result, identifying the ownership and intellectual properties of ideas is one difficult in these stages. In which the public good is not the information itself, but the sense of belonging to a community and viewing the community as a source for expert advice. Therefore, ownership of information can be defined from a legal aspect or from a psychological aspect” (Chu and Chan, 2009).

Japanese product development systems also display characteristics of a bottom up systematic method controlled by top management. “Japanese method Ringi Seido is quite a complex process from idea creation in the original group through development of idea by active participation and contributions of other groups (departments) in the company towards the top management’s decision-making process” (Zenko, 1993) sighted (Zenko and Mulej, 2011).

### 2.2.2 Approach to community driven product development

The approach to product development can discuss in two points of views. They are basically, according to the viewpoint of customer and according to the viewpoint of company. Ahrama (2010) states that, customer identification is a major part of NPD process. Identifying consumers who are the potential first buyers in the product market is the main key point to make a new product success. Svendson et al. (2011) also specially focused on customers and found understanding the problems and needs of key customers among the other customers is a critical factor for the product developers. In this regard, a discussion forum is a popular gathering stage for the community congregation. As Füller and Mühlbacher (2006) suggests, the requisite of the input for the total procedure depend on the stage and the value of the resource. Recognizing the valuable sources is the most important factor in this process. The first step of Idea Generation and Developing concepts focuses on the classification and generation of opportunities, the innovative ideas and novel concepts. For an example, the external resources for this procedure stage are inventors, lead consumers, designers, engineers, other pioneering community members or heavy users. Their involvement in the process of development can add to the created suggestions (Füller and Mühlbacher, 2006). It has been recognized that engineers with experience of customer support should be involved in product development (Hull and Cox, 1994).

Midgley, 1977, Wang and Fesenmaier, (2004) states that, information interaction on the Internet exists in cooperative forms and shows the strong enthusiasm of members to share their own experience and information even though the parties do not know each other. Chu, (2009) states that almost certainly, professional involvement is much more effective than the input of ordinary members. In addition, considering personal differences of the members and the characteristics of the product or industry, the unreliable situations regarding psychological factors of participants should be a focus, specifically whether or not participating in consumer based invention will be a fulfilling experience (Chu and Chan, 2009).



Jitesh and Panchal (2009) originate a new theme for the mass scale of gathering named 'Mass collaborative product development'. Mass collaborative product development refers to an example where large numbers of people work together globally as an extensive community to develop products and services. An example for mass collaborative product development efforts includes Wikipedia (Jitesh and Panchal, 2009).

## **2.3 Web based approach**

### **2.3.1 Virtual Communities**

In modern product development, the community gathering occurs as a combination of tangible or intangible groups. VC are intangible groups with new initiate based on internet and web. In this regard, their congregation space is the cyber space and people from all over the world gather there.

Also Virtual communities can define as groups of people with similar interests and practices, who communicate for some time duration in an organized way over the Internet through a common location or electronic/mechanical system (Ridings et al., 2002). Furthermore, a virtual community can define as a group of individuals who communicate using electronic, such as the Internet, and consequently share interest without being present together at a particular place. These groups do not need to have physical contact or belong to the same ethnic group (Kardaras et al., 2003)

Rheingold (1994) states that the social congregation that appear in the Internet when a set of sufficient people continue those open discussions is long enough, with adequate human feelings, to shape webs of personal relationships in cyberspace. A virtual community can also be seen as a group of people who may or may not meet each other physically, and who communicate words and ideas through the intercession of computer bulletin boards and networks. (Lin, 2007).

### 2.3.2 Web based approach in product development

Report by Data Monitor (1999) forecasts that the global online population will top 250 million in 2002, and a massive 300 million in 2005 (Warrington, Abgrab and Caldwell, 2000). When considering the technological and global explanation, Internet is the most common and easiest method use for global meetings and get-together. According to Internet world state, (2010) there were only **361 million** Internet users in 2000, in the entire world. **For perspective, that is barely two-thirds of the size of Facebook today.** The number of Internet users in the world in year 2010 is 1967 million. In 2000, Asia, North America and Europe were almost on an even footing in terms of Internet users. In 2013 the Internet users in Asia was 45.1%, Europe 20.2%, Latin America and Caribbean 10.8%, North America 10.7%, Africa 8.6%, Middle East 3.7%, Australia 0.9%. The Internet has not just become larger, it is also become more spread out, **more global** (Internet world state, 2014)

The community based modernization method is introduced in the following explores how to categorize and enter online communities and how to interrelate with their members with the purpose of getting valuable and important input for new product development (Fuller and Mühlbacher, 2006). There is a clear deviation of views on the concept, function and suggestions of online communities. Joints activities and discussions to help each other, and share information. Through these connections, they build associations with people and form a community around the domain. Within the online communities, there is plentiful discussion subject matters posted on bulletin boards and developed with the cooperative assistance among the members. According to this method, it is easier to share knowledge and information well (Chu, 2009). Among much larger groups of connected individuals and organizations or communities; texting, instant messaging, email, blogging, virtual worlds, and social networking are examples of methods that enable more frequent, faster, and richer connections (Sashi, 2012). According to Chu, (2009), the forums, chat rooms, message boards, instant messaging, guest books, mailing lists and group calendars are the key and elements and most commonly used tools.

The Internet allows sellers to establish a continuous relationship with customers across different landscapes. In addition, knowledge and interests shared among the customers and extend the reach and scope of customer interactions to reach competitors or prospective customers (Sawhney et al., 2005). Referring to communities in which information and communication technologies, particularly the Internet, facilitate the communication of members and who share a exact purpose, are helpful to increase the performance in online communities (Blanchard & Markus, 2004). Firms and community mangers can make a structured platform for the online customer integration. It is an effective way to select the media, identify the knowledge and integrate at the most suitable phase. Information sharing and its integrating mechanisms are an important foundation of community management (Chu, 2009). Knowledge in online communities is a kind of outward behaviour implemented by knowledge owners and inward behaviour implemented by the people who searching knowledge (Chu, 2009).

The Internet users surveyed in the study, 60% visited and shopped online, and nearly 20% had actually made an online purchase (Warrington, Abgrab and Caldwell, 2000). Some websites force individuals who want to register online for free to join by reducing the financial risk of joining (Pitta and Fowler, 2005). Information sharing and helping behaviours in online communities are conservatively viewed as comprising of information allocation in response to requests for assistance (Raban and Rafaeli, 2007); (Subramani and Peddibhotla, 2004). Gounaris, Dimitriadis and Stathakopoulos, (2010) states that web allows e-businesses to supply and share more and more appropriate, timely, and economical information with the customers. Pitta and Fowler, (2005) indicated that, the facts which are contributed by informational and technological support through online forum websites are the places where the people share interest of community that related to specified product category or product group. The foundation of starting discussion or the approach of issue will lead the discussion. These forums provide their community members to put their contribution through exchanging ideas, discussion of issues, or the solving of problems, and with access to a depository of knowledge collected by the community over time (the forum archive).

Social media can be called as another section of social gathering. The interactivity of social media that is with the ability to set up conversations among persons and firms in communities has become excited practitioners. As well as consumer-oriented social network sites, numerous professional and trade associations have set up some networks to exchange knowledge and information on particular interest among the members. As an example, the social networking site “LinkedIn” is mainly targets the professionals (Palmer, 2009). Furthermore, the virtual groups, which are unplanned initially, and absent legitimacy in the eyes of the organization, often achieved better results than formally established organizational groups (Gapp & Fisher, 2007). Lin (2007) stated that sustainability of a virtual community is depend on web site visitors, facilitation the social communication among members and the majority enhancing the area of community members considerably.

## **2.4 Customer Integration in Firms’ Perspective**

### **2.4.1 Firms**

Firms are increasingly focuses on the success of new products to earn sustainable growth and profits (Steenkamp, Hofstede & Wedel, 1999). Chu and Chan (2009) state that traditional product development process and marketing obtain a place within the limits of the firms and it is not spread enough to the community for product development. Furthermore, there are several factors led to wear away innovations in the modern society. Instructions can be transfer in to physical product so firms can look around to find the ways to increase the efficiency and effectiveness by searching innovations and technology from outsiders. One another step is to corporation through suppliers and competitors. Product development and innovation process allows companies to gain competitive advantages, keep exit customers, attract new customers and strengthen their distribution network. (Kotler and Keller, 2006; Cooper and Kleinschmidt, 1990). Chandra and Neelankavil (2008) state that, PD is the bloodline of growth for international companies. From using the Internet and World Wide Web sites as communication and promotional tools to distribute functions, marketers can find an entirely new world of consumer purchasing behaviour. (Warrington, Abgrab and Caldwell, 2000).

Another important indication is that suppliers need to estimate the capacity and enthusiasm of their customers to be involved in this joint product development. Commitment makes everyone happy. As a whole community, only few volunteers engage on firms to design development without any benefit. Involving customers in NPD requires commitment to maintain the relationship between customers and suppliers. The suppliers need to evaluate the enthusiasm and likeness of the customers to make such investments (Svendsen, Haugland, Grønhaug and Hammervoll, 2011).

Leading firms combine and lead external sources of ideas into product design (Yeh, 2010). Chu and Chan (2009) look at the company perspective and stated that internet offers new possibilities for valuable insights to the innovation process and guide to use the creative potential of customers. Manufacturers are able to identify customer preferences with the changes of prices and the standardize demand estimates (Teichert and Wartburg, 2005). However, Chandra and Neelankavil (2008) look from a different point of view and stated that creativity in PD has two different approaches. Companies those are successful through technology driven PD or understanding the customer needs. It express that most companies are familiar with technology based approach and only sometimes they looking for customer integration in PD. In technology based approach, internal research and development efforts or new external technology developments are the main strength to new product developments. In CDPD process, some international companies try to solve customer's problems with very little or no additional technological factors (Chandra & Neelankavil, 2008).

In product design process, firms are more intelligent than consumers, about possible technical solutions and maximizing the efficiency (Yeh, 2010). Teichert & Wartburg (2005) state that, if one recognizes the importance of customer integration at stages of the NPD process, the problem of how to get benefits efficiently from customer's valuable contributions turn into a central concern for firms. For an example, Hoffman, Kopalle & Novak (2010) studied how firms should find the correct type of customers for their NPD process. He argues that this correct type of customers have a

developing nature, that means they can imagine well. Open innovation models also apply to the commercialization stage. Companies might drag out already commercialized technologies in which more value can be realized somewhere else. Otherwise, they might get already commercialized product categories or businesses that can provide instant foundations for the new growth of company (Chu and Chan, 2009).

When innovations released to consumers in digital entertainment, the previous experiences of customers affects the evaluation of its features and affects the quality of the product while outsourcing (Yeh, 2010). However, if firms do not identify new applications, they will not perceive any resulting new markets. Covert, overt and mixed modes are three possible interaction models that can use by firms. A covert interaction is defined as a community member asking questions from the community. Overt? Mixed? Moreover, firms must decide how to handle such information (Pitta & Fowler, 2005).

#### 2.4.2 Customer Involvement as an advantage for firms

Interactions among sellers and their customers can improve the understanding of customer needs. Especially the changes in these needs by the time and help modifications of existing products or the development of new products help to satisfy customer needs (Sashi, 2012). Companies successfully introduce new products through a well-developed process that leads them from creative ideas to a successful launch of the product by focusing on satisfying specific consumer needs (Chandra & Neelankavil, 2008). It does not mention the successful products are developed with the consumer involvement but it mentioned that firms always try to make successful products and to fulfil customer needs. Customers are not only involved in providing ideas for new products but also in creating and forming them with the firms (Yang, 2011). Some digital entertainment firms have gone further within their practice. They outsource the innovation process to members in digital networks (Yeh, 2010). Consumers are various and they have rapidly changing preferences. By involving consumer in product design and development, firms can create own demand on their

consumer products. Palmer (2009) also states that, by inviting members to feedback or simply observing their conversations, a company can learn about the needs of customers and include those facts in their new product development policy.

As noted by Quitty, Finn and Wiley (2000), satisfaction of influence on purchasing behaviour is a critical fact. Such behaviour helps firms to increase their market success and profitability and customer involvement should facilitate the supplier to develop better functional requirements, modify the design or reduce production cost. For instance, Igloo Products Corporation used a colour consultant to develop colour coolers for their firm and new colours increased their sales in 15% (Lane, 1991).

International executives in developing countries often have limited budgets for their Research development due to the shortage of capital and high cost (Chandra et al., 2008). (Sull, Gossi, and Escobari, (2004) states that because of the financial problems, the effort of executives allocated to cost cutting in areas such as manufacturing, logistics, marketing and customer service. Hagel and Armstrong (1996) have identified that firms are able to provide better support to the product and information delivery by using communities as they learn about their customers. They are also able to answer to customer needs in a better way.

Not only the firms but also the communities should have a trust worthy environment to work. As well as the reputation of company and people, the reputation inside the community is also important to survive. If users are not trust-worthy, open, interesting, relevant, perceive online brand communities and engaging with the target audience, they can quickly harm the reputation of the company (Palmer, 2009). According to the firms, the members can effect on company reputation in positive or negative manner. A virtual community is a vast gathering space and effecting negatively to the public might cause to damage the reputation of the firm. Therefore, firms must have their own controlling on their virtual community. There have been reported cases of companies disguising their involvement in a community by falsely posting messages. They pretend those messages come from a member of the public to appreciate some aspects of the company actions (Palmer, 2009).



There are some examples can find in previous research data. Volvo for example, presented different concept cars as possible future offerings ([www.conceptlabvolvo.com](http://www.conceptlabvolvo.com)). After virtual presentations and test simulations, when the visitors familiarized with those car concepts, they can give their feedback. Recently developed methods like strengthening the idea of collective, invention and trust building are the other way to gather online community members in the testing stage. (Füller and Mühlbacher 2006). Also indicated that Procter and Gamble have installed a P&G Advisory Community where users can participate in designing, testing and launching new products. Under the category of ‘Share your thoughts’ on the P&G homepage, the public visitors may find the status of an Research and Development advisor by providing their contributions to different development categories in the site. This extract of web-locations proves that consumers are highly involved in automobiles and are largely present on the Net.

However Haier Chinese manufacturer found that rural Chinese people using their washing machines for both washing clothes and vegetables. After doing some modifications, they modified the machine for the customer required. After few years, Haier became the market leader in rural China (Sull, Gossi and Escobari, 2004).



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## **2.5 Customer benefits on new product development**

### **2.5.1 Customer integration in new product development**

A spiralling process of interactions among persons with facts and come from different backgrounds create new knowledge (Füller, Mühlbacher, Bartl and Ernst, 2006). A key feature that can influence the effectiveness and financial side of customer support is product design (Lele, 1986). Customers who have the almost equal interests or needs effortlessly build communities to communicate and help each other in developing and modifying their own products (Yeh, 2010). Customer support is now being recognized as an important research priority (Loomba, 1996).

A major and recent change in business markets was the growth of the participation in industrial customers to new product development processes for manufacturers.



(Bonner & Orville, 2004; Kristensson, Gustafsson & Archer, 2004). Also customers are similar to the partners of value creation during NPD process but the chances of actively involving them into the process are neglected frequently (Teichert and Wartburg, 2005). The argument of new product, constantly discussing the proposal, responding and building a general awareness about the innovation helps to appear a new common knowledge throughout the community. (Sawhney and Prandelli, 2000).

Teichert and Wartburg (2005) go on to say that customer knowledge can be differing and their thoughts individual or special. It is difficult to identify the need of idea integration at the certain stages. Under these thoughts, three questions can be structured to develop a typology for the customer integration on online communities; Which type of structure relationship can create through online customer integration? Which type of knowledge can generate through online customer integration? And at which stages customers can contribute their knowledge for customer integration NPD? (Teichert and Wartburg, 2005).

Heiskanen, et al, 2007 states that customers' choices develop through the involvement with new product ideas, concepts and prototypes throughout the different stages of new product development. In addition, at the end of the process, customers can be innovators. People are spontaneous to provide free assistance and information, which encourages reciprocity between members. Therefore, developing the active participation of community members is can be somewhat critical. Only through continuous online communication by the organization members, can create new information. By that, they can make the online space more attractive through the sharing of increasingly plentiful resources (Chu, 2009).

The path to innovation can be widened by gathering more parties that are interested into the process (Chu & Chan, 2009). Heiskanen, Hyvönen, Niva, Pantzar, Timonen & Varjonen, (2007) state that during the pre-launch stage of a product, it is important to identify customers' information development as progression process of mutual learning with them. After that, ideas can evaluate and refine by using experts and other consumers. In the concept and design stage, consumers evaluate both internally

and externally. (Chu & Chan, 2009). The initial stage of Idea Generation and concept development are focused on the recognition and the generation of opportunities, brand new ideas and novel concepts. The inventors, designers, engineers, lead users, other innovative community members or serious users are the external resources for this development process stage. Their valuable contributions can add to the created suggestions (Füller & Mühlbacher, 2006). Design management involve in the initial stage to end stage with the experiences of inventor, user, engineers and designer. The lead users or guides in those networks share equal interests, and take advantage of connectivity for the design development, and furthermore the distribution of new products. Additionally, customers provide new solutions within new product designs for their own needs through the configuration of needs-forecasting agents in those network sites. (Yeh, 2010). Loomba, (1996), Goffin & New (2001) suggest that it can have more demand in economical, efficient and successful customer support when customers are in different sectors with different experiences and different purposes. Different products can have different key elements of customer support. Usually, the products that are more complex require more features of customer support (Goffin & New, 2001).



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Finholt and Sproull (1990) states that in the Internet world there are countless viewers who always silently look through the information posted by other members. In the current terminology, these silent members are called lurkers. They rarely involve with the discussion or sometimes they do not. Zhang & Storck (2001) more formally call these members as peripheral members. According to findings of Chu (2009), peripheral members are less visible in online communities. When share information in the three stages of NPD, voluntary supported (prosaically) behaviours and mutual (reciprocal) behaviors of the members positively and freely connected. Chu & Chan (2009) stated in their research that under certain conditions, most community members are agreeable to share their ideas free. Their prosaically and reciprocal behaviors are completely related with idea generation, concepts development, design engineering, with testing and launching a final product (Chu & Chan, 2009). By taking into areas previously untried, consumers might test products extremely. Usually, such consumers are a potentially rich when product testing. They

not only can differentiate what works from what does not, and can give the reasons why to be like that. In the first place, the main notable point might be that they can explain why the problem is important to them (Pitta and Fowler, 2005).

The Japanese assessment system is based on group rather than individual performance. It supports the structure of a self-organizing team, advances multi learning among team members. Moreover, it helps to build trust, unity and peer demands. Then the management establishes superseding values that shared by everyone in the organization (Jacobs and Herbig, 1998).

### **2.5.2 Positive and Negative aspects of Community based product development**

It is proved that the dimension of online communities and members' interrelationships affect both positive and negative ways on their members' performances that lead to assist others (Chu, 2009). Each contribution depends on the person and his background or the perspective. There is a problem to identify those influences either as useful or genuine. People may appear to contribute something, but what they do not contribute is more important. This has identified as a risk. Furthermore, it might be happens accidentally when members contribute, or according to the environment and situations (Dyer and Nobeoka, 2000). However, Ahrama, Karwowskia and Amababa, (2010), mention different opinion, Collaborative Virtual Environments do not discuss potential outcomes in design. Only statement that express, a virtual environment not contribute to the outcome. Chu (2009) indicated that voluntarily helping behaviour does without expectation of any rewards. Nevertheless, as a motivation some virtual communities get rewards because some members are uninterested in developing product concepts in design stage (Chu & Chan, 2009). (Hippel, 1978) sighted Teichert and Wartburg (2005) also states a negative point about community driven approach, lack of customer and user involvement in innovation processes make the reality the quote of "speaking only when spoken to".

Cooper (1979), Chu & Chan (2009) states that, such specialized, fine-grained information and knowledge from customers is important and helpful in PD processes. They can secure that the firm or the company develops products and technologies that match with customer preferences. In most communities, there are potential users with better understanding about their platform, requirements and technological imitations. (Zenko and Mulej 2011). Yeh (2010) states that through producer or the creators, consumer's cooperation in product design, the quality of interaction, sensitivity are associated positively with product performance. Nahapiet & Ghoshal (1998); Lesser & Everest, (2001); Fetterman, (2002) examined that it allows people to work together cooperatively, for the betterment of the group rather than the benefits of the individual persons.

Svendsen et al. (2011) Indicate that, usually, the supplier's products are at larger profit margin and therefore the result is in better relationship profitability. Because of a less physical prototypes and lower expenses on marketing research lead to speed up the innovation process, make the costs of new product development low. It makes unclear front end controllable, improve the customer oriented and innovative representation of the company, increase the interest and create hints about the new product in the target market. These benefits should facilitate long-term. In the stage that test and launch, customers can introduce new product, give their response on displayed virtual appearances, and test imitations. Companies need to maintain positive satisfaction among the customers to increase the loyalty of them and create more profits. Customers who are not happy with the given profits demonstrate that the community is at a risk (Chang and Hong, 2011).

### **2.5.3 Catering the Customer needs as a benefit for the customers**

As product differentiation becomes difficult in many markets, companies are increasingly looking for the customer's support. It can be used as a potential source of competitive advantage (Loomba, 1998). Vazifehdust, (2011) also states that, in marketing literature, often argued that the marketer should pay attention to the customer needs to attain and maintain successful business relationships.

It is difficult and costly for products to meet the demands of hyper-differentiated customers (Yeh, 2010). However, it can be difficult to arrange a concept for the community according to the desire of the company and control communication for its advantage (Palmer, 2009). In fact, Slater and Narver, (1994) sighted Heiskanen et al. (2007) indicate that one of main consequences of market orientation was according to the performance of new products that were developed with the feedback from the market. Yang, (2011) states that, recognizing customer needs and wants and transforming those into product attributes can lead to successful NPD performance. The catering customer requirements, directly effect on the future purchase behaviour on products. Because of the customer satisfaction is a main feature of NPD. Understanding market and delivering new products that meet or go beyond customer expectations are identified as two of the most critical factors in new product achievement studies for decades (Cooper, 1979). Athaide and Stump (1999) farther states that suppliers need to determine how precisely they are willing to meet their customers' needs through the product configuration at an early stage of the NPD process.

In research conducted by Beatty and Mayer et al. (1996) three factors were found to influence trust.

- (1) Continually demonstrating they had the customer's best interest at heart,
- (2) Skills to meet customer needs, and
- (3) Customer problems solved honestly (Warrington, Abgrab and Caldwell, 2000).

In the game world, customers can continuously modify the arrangement of qualities to enhance the uniqueness of the characters. For example, a console or online role-playing games include strong main characters with a range of characteristics that the players can customize according to their choice. Social interactions might increase personal relationships by providing suitable goals, operators, and feedback of customers (Yeh, 2010). According to the findings of Chiang (2010) when facing issues of deciding, which channel to buy among all the products, consumers also have to consider few criteria. Such as product information accessibility, instant

ownership of products, helpfulness of sellers, brand selection and variety, post-purchase service, and exchange-refund policy for returns. Vanhamme and Snelders (2001) states that customer satisfaction is important for future success and decision making on new steps. Satisfaction is an important marketing topic because it influences word of-mouth, consumer approach and their retention.

#### **2.5.4. Benefit for the customers**

Customer intergradations are beneficial for both firms and customers. Customers can predict products that match with their requirements. Therefore, firms can provide benefits exchange to their service. Integrating the customer knowledge in to product development will allow the supplier to develop products and services that provide more value and solve the customer problems in a better way. Hippel (1994; 1998) Moreover, it should develop a design that meets the special requirements and problems of customers largely. With the involvement of consumers in product design, product features can be nearly and continuously associated with customer requirements. (Yeh, 2010). It is traditionally recognized that unselfishness is necessary to receive mutual benefits. For an example, it is an information exchange behaviour as “I will tell you about the performance of my washing machine if you tell me about the reliability of your car” (May, 1987; Peck and Feldman, 1985) sighted (Palmer, 2009).

Pitta, and Fowler (2005) indicate that, the members are also the employees of the firm. The product development and innovation was a strong point of companies in fully developed countries through Research and development. Through the combination of information and ideas, they were able to introduce new products (Chandra and Neelankavil, 2008).

#### **2.5.5 Motivations**

Chu (2009) indicates that, these online communities are complex social groups. The observation of helping behaviour in these networks occur problems regarding

motivation and the mechanisms that support the network. Furthermore, information sharing and knowledge contribution can effectively facilitate, if there is a network technology available for members to enjoy a suitable, interactive environment. Füller & Mühlbacher (2006) states that community integrated design should have an understanding about its members and how to motivate them. A collection of specific user behaviours that gained from past-learned lessons and previous online community thoughts can help to motivate members. Although much literature provides a number of tools to interact virtually with consumers, still there is no systematic approach to identify, motivate, and interact with qualified consumers. If there was such a system, that can lead to share their knowledge with producers during new product development. Motivate to online communities stems, first need to increase self-worth and their personal identification (Chu and Chan, 2009).

However, Svendsen, Haugland, Grønhaug and Hammervoll, (2011) states another point about strong brandings. Emphasizing a strong brand profiling emphasis may give consequently result for customers, with less motivation and wanted to be involved in new product development. Difference between market based and collective forms of innovation is increasingly clear that companies do not have a control on innovation (Heiskanen et al., 2007). Therefore, firms should attract users to join in the online communities, and promote both the idea of a common goal and passionately interactive discussions about new ideas. The motivations need to be given not only to encourage people to share information, but also to share valuable information (Chu and Chan, 2009). That is an important point because some people join virtual communities only to get benefits and promote themselves without any valuable contribution to design process.

#### **2.5.6 Trust**

Simply providing a web-based community network does not guarantee a successful virtual community (Preece, 2001). Winning the customers' trust and maintain it is more important to e business (Warrington, Abgrab and Caldwell, 2000). When compare professional and personal services providers, customers more like to be guided by information, which are provided by friends, and other personal contacts



rather than formal promotion combined companies (Harrison-Walker, 2001; Susskind, 2002). Palmer (2009), Warrington et al. (2000) states, positive word-of-mouth recommendation is generally dependent on customers having good experiences with a company. This often led gain useful feedback and recommendations. The lack of physical presence of the product and the physical distance between the buyer and the seller creates a gap. Here in virtual communities it makes a unique situation because trust is more important (Warrington et.al. 2000). Yang (2011) states that by strengthening the relationship instead of trying to select the right idea, firms could approach the problem through customers. The idea security is also one important part of product design. Most communities are open to public; the threat of competitors getting access to information is very high. The community space should keep as a secret and need to address an enough number of participants or members from predefined market segments. It is especially important for the testing and launching stages, which requires more consideration that is careful (Chu and Chan 2009). (Ahn et al., 2004; Rodgers et al., 2005) states that expected life cycle of web sites were developed and launched as a real community based network, but ultimately they have transported themselves to conservative and commercial web sites that seek for profits.



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Warrington et al., (2000) argues that there should be a trust worthy relationship from the sellers' side too. They must develop a trust worthy relationship to make their initial sale to develop the relationship of trust. The first customers are one always important for them to survive in future market. GamesBlog, (2006); Graft, (2006). Sony Company implemented an open marketing campaign for their play station and realized that their customers trust is undermined by the truly independent user comments. If consumers are much familiar with recommendation systems, they have to expect a higher level of visible risk (Wang and Benbasat, 2005). Iyengar and Lepper (2000) found that variety of product is valuable for the customers. That is a better way to make a good relationship between different members. It provides the customer satisfaction and increase the sales. Many online businesses manage and provide services of recommendations with the support of intelligent agents. They analyse profiles, product preferences, salient attributes searched or valued of the customer. Then provide accurate offers to each person (Benbasat and Zmud, 2003)



"Registration involves supplying identity and contact information as well as a preferred nickname to preserve anonymity in discussions. Typically, users asked for a valid e-mail address. When supplied, a registration password returned to the user's specified e-mail address. This practice serves as a partial safeguard against fraudulent behaviour, reducing that risk" (Pitta and Fowler, 2005).

Privacy is an important issue in today's online communities. Confidentiality of information is also support to maintain the good relationship between the customer and entrepreneur. Ease of access to resources a determinant of creation is important to members who expect it (Chu and Chan, 2009).

## 2.6 Culture and Design

Firms are trying to differentiate their products when they cater the global market with product differentiation by identifying consumer needs and barriers. Living in a foreign country for a certain time and its effect on customer thinking, how re-evaluates products from a different country (Josiassen, Lukas and Whitwell, 2008). Designs are like an agents of change in a culture and it is important for them to find the way to understand the weaken points and cater the local cultural systems (Popovic, 2002).

Global marketers try to extent their market and products by differentiating according to the regional and customer base. Chandra et al. (2008) describe that, innovative products have large market potential in industrialized countries when compare with the developing countries. The main barrier in developing products for less developed countries is affordability. It further says that International dealers never reach the accepted market potential in the Electronic products like computers and telecommunication equipment within market of the developing countries. Due to the high cost of newly introducing products and limited opportunities for profits, international companies do not waste their time on less developed countries. However, at the same time it says, most international and global companies enter to

the foreign market with essential products and gradually modify them to adapt according to local conditions. As an example, some commonly used products like toiletries and detergents developed in industrialized countries are not easily accessible for countries due to the high cost and corresponding low-household incomes.

“There are formal and informal structures. There are prevailing rules, norms, values, culture inside a given social system. It can have sub-groups per age, units’ size, education, income, gender, profession, location, department, etc. that do not behave the same way. However, the system gives the stability and regularity” (Zenko and Mulej, 2011).

Except the countries like China and India, the middle-income markets tend to be small. 5% to 10% of households in most developing countries categorized as middle-income group (Chandra et al. 2008). Products can differentiate according to the specified context with unique changes but rest can be used in global context. Products come to less developed countries with similar markets. International companies develop wide variety for the home country but not successful in catering developing countries because of feeble attempt for the customer attraction. The products that are developed for industrialized countries have some market potential in developing countries but products that developed for less developed countries are never in markets of developed countries (Chandra et al. 2008). When companies target on low-income market in developing countries, then it will become successful. Customers with higher incomes might evaluate foreign products more positively than will customers with lower incomes (Han and Terpstra, 1988). Zenko and Mulej (2011) states that the 2008 global economic and social crisis was caused in the most developed and innovative countries. Because of that, the innovations were limited to essential technical innovations. It identified some cultural barriers that occurred in social structure. The diffusion of innovations categorized according to norms, values, culture, ethics, common goal, territory and hierarchy. Those are identified as cultural briers and in a social structure.

The reason mentioned by the international companies for less attention and commitment on the developing markets is the marginal potential that these countries offer. A range of Challenges identified in developing new products for less developed countries. The product development process is complex, time consuming, expensive, and risky. Moreover, the successfulness of PD in developing countries is one out of 6.6. When international companies target developing countries with innovative PD, the issues prevent their effect to success in the market. According to the above research, found four major problems that international companies face when develop new products for the markets in developing countries (Chandra, et al., 2008).

- (1) Price income levels
- (2) Technology developmental issues
- (3) Capital constraints
- (4) Creativity

Though the context is different, some critical facts are same in most countries. There are some barriers have identified that local firms faced. This demonstrates that the local companies in these countries do not have enough resources, such as qualified researchers, capital, technology and material to develop new products for their own markets. Moreover, lack of movement in international companies and resources that local companies have, cause to stop getting benefits for the customers in less developed countries for new products. If international or local companies can offer new products that have some additional benefits compared to existing products and at the same time are within the price range of a target segment, they might have a higher possibility of succeeding in developing country markets (Chandra et. al., 2008).

Chandra et.al., (2008) further states that, developing products for low income countries is an extra resource allocation for international firms. Firms' focus return on investment. The lack of consumer purchasing power, technology and capital, make developing new productions difficult or impossible for international or local companies in developing countries. Therefore, it is difficult to justify investing

human capital and financial capital for product development in such countries. International companies generate their profits from large industrialized markets and their intent on those investments is less. Because of lack of capital, international companies having difficulties to justify investing on research and developments on developing countries. It defined customer oriented value added approach by considering two basic requirements. First is to identify at 'what price point' the low-income population would can afford on product or service. Second is to identify what are the 'value added' elements to the customer. They develop products or services for the markets of industrialized countries, which can get the support on those innovations according to its value. By the other side, the majority of international and global companies enter to the foreign market through basic PD and modify those for the local conditions. As a result, a possible solution for introducing new products in less developed countries is to reconsider the process of NPD (Chandra et. al., 2008).

## 2.7 Furniture Design Industry

### 2.7.1 Local and Global furniture market

Furniture is an essential component that makes a space functional. Most of the time people cannot work, customers cannot be served and the equipment and tools of the business cannot be housed without furniture. In daily life, it supports all of the functions and services people that much. (Graham and Demmers 2001). According to Khandani (2005) Furniture design field holds a vast area. It differs on age of the user, materials, function, environment it positioned. Design is the area of ideas, skill and knowledge of the human. It is more concerned with ability of moulding environment, which is suitable for its material needs. Combination of those creates the functional environment. The continuity environmental experience of an individual is beneficial to his or her quality of life, confidence and independence (Hwang, Cummings, Sixsmith and Sixsmith, 2011).

The European Union is the largest region of furniture production and consumption in the world. It holds about 36.5% of the world's furniture manufacturing and will keep the increasing trend over the next years. Mainly Italy, Germany and Great Britain are the greatest furniture manufacturers and hold almost 51% of the common EU production (Dimkow, 2012).

According to Jayapala and Amarasekera (2003) findings, in Sri Lanka Moratuwa area holds the major part of furniture manufacturing industry. When 41 furniture items are considered mainly, the total number of furniture production per month is estimated as 63,612 units. Teak consider as the most popular wood in the industry. Teak Cabinets, Teak Elmira and Teak Chairs are the main manufactured items. The overall monthly income from all the FMI of Moratuwa area is estimated to be Rs. 54.05 million. The study revealed that the Moratuwa area has considerable amount of mechanized carpentry sheds and some are associated with furniture shops or saw mills. 83% of furniture is manufactured using heavy wood species and other 17% is using light wood species.



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#### **2.7.1.1 Ergonomics and Issues**

Anthropometrics and Human ergonomics handling a major role in furniture design industry. Some major furniture manufacturers instead, each company based their designs on specifications from the British Standards. According to the standards, they decide the height, depth and width of a seat. Existing designs have not changed for years. Non-ergonomically dimensioned furniture is not suitable to body dimensions, increases physical strain and commonly results in uneven posture (Domljan, Grbac and Hadina, 2008). The use of ergonomics knowledge, study human and office furniture as a whole, will not only ensure the environment fit for the physical body, but also will make people work in scientific, healthy and reasonable way and appreciate the fun of work in the efficient way (Xu and Zhang, 2013).

Adu G, Adu S, Effah, Mensah, Darkwa (2014) states that the office furniture is to facilitate people, to carry out their work efficiently. However, office furniture from manufacturers is not designed according to an individual user. Not all desks offer an overall height adjustment and chairs of different sizes, individual adjustments for the seat, arm and back. Instead, a one-size-fits-all philosophy has been adopted in the industry, because such furniture is less costly to manufacture, easier when mass production, easier to sell at a lower price and lessens the inventory problems for manufacturers.

These days a worker is required to do office work with the office furniture (desk and chair) for at least six to eight hours per day. Therefore, eight hours a day in office is possible not only to cause physical tiredness and disease, but also to have negative psychological effects. Modern office furniture should be designed to express the design values, which are centred to human.

The seated posture allows focusing the attention on external or internal stimulus while the body is supported and relaxed. In Western countries, students are usually seated in chairs. When assumed for long periods, seated posture of the standard chairs put considerable strain on the lumbar spine (Parcells, et al., 1999). According to Adu et al., (2014), most of the furniture found in classrooms is not designed or suited to the anthropometric dimensions of the students. Situation in public institution such as schools, courthouse, library, hospital and other places that run for the public to use is also the same.

Age is one important market segment to cater. Many elderly people have many experiences about both furniture and the variety of physiological, psychological, social and housing related changes that may occur during one's lifetime. Improved understanding of human and furniture relationship will create better conditions and it will help to identify what type of furniture suits the new older generations. This may twist the contribution of design ideas and furniture will increase people's quality of life and will not ignore elderly people's subjective perception of the physical environment (Jonsson, 2013). Barros et al., (2012). When the relationship between

form and material is established well, there is space for user in the system, by having the opportunity of exploring a custom solution. It can be performed in the physical world and under structural, manufacturing, economic, environmental and cultural conditions.

#### **2.7.1.2. Design and Technology**

According to Boon-Kwee and Thiruchelvam, (2011) design integration makes the process more efficient. Designers are more probable to produce better results as they develop confidence, experience and practice skills with designing process. However, many enterprises do not have their own in-house professional design teams (Pimapunsri & Tichkiewitch 2013). Ivelic, (2002) discussed about design process, the design process starts with the understanding client's needs and identifying problems. Therefore, the first step is listening to clients, understanding their ideas and requirements. The designer thinks ideas with the client so that everyone is on same level from the beginning. Sometimes clients may not be clear in what they want. Nevertheless, sometimes they may have so many ideas and styles different from one another and the designer will need to edit and redefine them into a clear vision.



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Mostly, all problem-solving tasks or designing begins with a need. However, different tasks may require the designer to enter the designing process at different points. This study categorizes five main stages that are suitable for furniture design process. They are Situation, Investigation, Possible solutions, Realization and Evaluation. All those cover the total process including the briefing and outcome with all design and manufacturing stages (Nutassey et al., 2014).

Product engineering is presented to students as an application of a systematic, disciplined, quantifiable approach to design furniture structures. Designer should emphasize in the production process to create furniture pieces, which are fashionable, aesthetically pleasing, economically feasible, functional, ergonomically correct, easy to produce with short time period, and should apply possible materials and joinery in order to create structurally good product providing safe and reliable service. Product



designer should know the properties of materials used for product, weights applied in service and realistic design. Moreover, how to determine the most suitable fasteners, joints connecting systems and their acceptable stresses. (Haviarova, 2011). Finite Element Method (FEM) is the numerical technique widely used to analyse solid structures. In a CAE environment, FEM provides the ability to test designs, based on the estimate of a digitally separate model. The use of design automation to guide the search for the best design will be measured in terms of aesthetics and structural requirements (Barros, Pinto and Chaparro, 2012). Further states, The System for Thonet chairs is to guarantee the minimum thickness of the beech profiles in compliance with ISO standards. The aim of using computational technique is to allow additional exploration to the given design and to check the possibility of automating shape refinement. Therefore, assisting the designer in the search for an acceptable solution within a given set of conditions is needed.

A human centred approach to design is recognised as the consumer is the centre of the focus during the design process. The present research concerns, the early stages of a human centred design approach. Gould and Lewis (1985) recommend early and continual focus on users as an important principle in user centred design. In that design process, the users need to be directly involved from the beginning. Therefore, they can actually influence the design and not only be asked for validation. In order to be appropriate in design practices, the positive comments of contributors on product qualities will be broken down into a sequence of user requirements (Jonsson, Sperling, Östlund and Hornyánszky, 2012).

According to the study, it is clear that furniture manufacturers should design to meet the need for multi-purpose furniture for a new generation of consumers who prefer flexible and modern fluid living environments. The integration of technology into traditional home furnishing designs, such as the addition of fixed speakers into recliners (adjustable seats), is the type of innovation the industry needs to maintain future development. The influential consumers will help to expand the industry sales as their wealth increases and they move through lifestyle changes. Moreover, that will require them to purchase more and different types of furniture in the future. (Tourtellot, 2014)



### **2.7.1.3. Material Demand**

Numerical methods allow reducing material cost with the safety requirements and without affecting functionality. The technological routes are generated based on optimization results and deduction rules. (Gawronski, 2011). The furniture industry faces a consumer audience today that has multiple needs and preferences, some of them are in conflict. For example, the growing demand of construction materials that are sustainable and eco-friendly increase the price at retail due to the costs associated with sourcing the materials. However, consumers are willing to pay some amount for the ease and products with eco-friendly materials. Combination of manual and mental labour lead to make high quality cane furniture like chairs, tables, sofa sets, book shelves, beds, corner shelves, partitions, wardrobes, showcases, plantation cases, glass frames, trays, trolleys and show pieces. (Hasan and Dey, 2013). The demand increase for well processed, good quality canes in the world market and it is assumed that the demand is three times greater than the supply. In the total world export of primary forest products, cane occupies the second position next to timber (Nuruzzaman, 2001). Muar Furniture Association (MFA) with the collaboration of well-known design colleges in Malaysia discusses the ways to grow the industry (Boon-Kwee et al., 2011).



### **2.7.1.4. Marketing Strategies**

Usually, the furniture industry has not been known for marketing itself well. Industry leaders have been unwilling to research consumer preferences of the society or improve the customer experiences when using it. Because of that, the industry is running the risk of producing product that is not responsive and match to the needs of consumers (Tourtellot, 2014). Boon-Kwee et al., (2011) also have an explanation, Brand building is still lacking in the furniture industry. There is no lack of talented sales employees in the industry but there is a critical shortage of design and research people. Because of the nature of furniture industry where the designs of the products are easy to copy and duplicate with the experience they have, has discouraged the manufacturers to invest in designing and branding. Increasingly international wooden furniture buyers are using the internet to transform the way they do business and

work together with trading partners. Many of them use the internet to do business online and to develop close knowledge based links with suppliers (Moodley, 2001).

In the furniture industry, it is necessary to understand how consumers shop and purchase furniture. The traditional use of newspaper advertisements and direct mail are no longer the only and effective ways to reach consumers. For example, today television commercials and network shows, such as HGTV, can be used to target people of all ages. However, the industry has been fearful to engage in social media and it has become an obstacle that is needed to overcome (Tourtellot, 2014). Another threat and a trend for the furniture industry is moving the interior design network, where consumers work directly with interior designers for their furniture, wallpaper, drapery and other household furnishing needs. In furniture industry today, this approach expands 5% – 10% of furniture sales and starts to increase when the economy continues to recover. (Tourtellot, 2014).

The functioning of a commercial strategy, driven by the consumer's needs will allow increasing the demand of the offered products. It will lead to increase the market share and the firm profits. Sometimes in the sense that the consumer's choice is considered as a silent choice when one of the variables modifies itself even if the others, do not change (Schirone, 2012).

#### **2.7.1.5. Intellectual Property Issues**

For an industry that is already in trouble due to offshore manufacturing, duplicate producers can prove devastating gradually. Duplicate furniture companies, such as Pottery Barn, Ethan Allen, Room and Board and other popular retailers and designers are growing successfully in the United States due to the lack of intellectual property protection for useful articles like furniture. These companies produce furniture knockoffs at significantly lower prices than the original designers produce and make “custom furniture” available to price-conscious consumers (Richards, 2011).

Richards (2011) states that intellectual property protection is the main way to protect the creation of innovative designs within the furniture industry. However, it is clear that vast majority of furniture industry is not protected by copyright or other intellectual property protections. The Innovative Design Protection and Piracy Prevention act, would have amended the Copyright act to protect the appearance and its ornamentation for a three-year period while adversaries of the invoice quoted the strength of the fashion. However, Current copyright law only protects useful articles to a certain extent and its ornamental aspects are separable from the functional aspects. The various tests for conceptual separability are unclear and results are unpredictable. Design patents similarly only protect new and ornamental designs where the decorative aspect is not primarily dictated by function (Richards, 2011).

### **2.7.2. Current Furniture Manufacturing Industry**

Current furniture manufacturing industry has identified three common methods based on consumer preference, traditional designs by carpenters and use of designs from foreign catalogues. Moreover, furniture can be categorized into six broad categories, based on their quality and finishing level (Jayapala, 2003). The furniture manufacturers form a close partnership with their immediate business environment. They are the suppliers, customers, retailers, and support industries. The suppliers provide what is needed in the furniture manufacturing process, such as machinery and equipment, and wooden materials. Retailers are crucial for marketing purposes while the customers are the product receivers of the furniture manufacturers. The supporting industries such as fabrics, painting, varnishing, finishers, foams and adhesives provide support in terms of adding value to the furniture manufacturing. All these four pillars of the immediate business environment are critical. The absence of any party will lead to the failure of the industry (Boon-Kwee and Thiruchelvam, 2011).

The advantage of large enterprises is along with the volume of production as they have bigger space, more capital and bigger workforce they get. The value of furniture is decided on the quality of aesthetic appeal and the craftsmanship of the furniture

manufacturer. This observation is in agreement with studies by Ettema (1981), Ratnasingam (2004) According to that the creation of value added furniture is not about using high quality materials or art technologies, but rather it is about expressing a lifestyle in a creative and innovative manner (Boon-Kwee, 2011).

Mexico continues to appear as a potential major source for the manufacture of low cost home furnishings. Manufacturing costs, including labour and transportation are now lower in Mexico than China. It has reduced to less than 5%. As same as all sectors of manufacturing, furniture manufacturers are also facing skilled labour shortages. An aging workforce has reduced the skilled workers in the furniture industry, specially upholsters and sewers. Moreover, fewer younger people are looking for those jobs. Main problem is that the industry is changing continuously but its image does not change accordingly. Many people believe that furniture manufacturing with layoffs, untrained manual labour and dark, dusty work conditions. However, the reality is as in other manufacturing sectors, furniture industry is also introducing advanced technology into its processes (Tourtellot, 2014).



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Tourtellot (2014) also states that association of Manufacturers specify that only 30% of parents are encouraging their children to enter manufacturing field. Only 17% of people see manufacturing as a top career option. The top 100 furniture stores posted a 7.8% increase in sales in 2013. Moreover, more than half of these companies indicate that they have expanded or plan to expand in 2014. That is the first positive news since the recession while having a number of challenges and threats in the industry

## 2.8 Summary of Literature

The first part of the literature provided a discussion on overall customer driven product development approach and practices. This section covered the information about different product development approaches Top-Down and Bottom-Up. Concurrently, it discussed about new product development, community driven

product development and its applications. The next part focused on the function of new product development in virtual communities and web based e-business platforms also covered under the literature survey. New product development application to the firms and customer benefits and negative aspects were also discussed in different viewpoints, i.e. that of the firms and of the customer. Further, it discussed about the application of new product development within the environment of a developing country while looking at some successful stories on different products.

The final part specially discussed the current furniture design and manufacturing industry in globally and locally. It focussed on the needs, issues and opportunities of customer driven product development in different market conditions.

The findings identified some barriers, challenges and awareness issues. Those are taken forward as a questionnaire for data collection which will lead to an analysis of those identified barriers within the Sri Lankan context and find out how those are applicable to furniture design and manufacturing industries. In the analysis, findings from literature will be further discussed in detail



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## CHAPTER 3

### Analysis

#### 3.1 Introduction

In Sri Lanka, many industries are administrated by hierarchical management systems. Bottom level, middle level and top-level managers are engaged in the organization's planning, organizing and controlling. This management system has existed in Sri Lanka for long time. Apart from this system, the newly introduced approach 'consumer driven product development' system is still hard to be found in practice in the Sri Lankan organizational management and industrial culture. Lack of internet usage in the country has caused less virtual communities and only a limited group of people who use the internet daily have gathered with the international knowledge sharing virtual communities. Therefore, propose of the analysis is to introduce consumer product development and web-based community product development in the Sri Lankan furniture design and manufacturing industry.



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##### 3.1.1 Need of a data collection

Socio-cultural background is different from one country to another. Sri Lanka is a middle income country. Several problems may cause when introducing a new system to developing cultures. Some of these problems can be identified by advanced calculations and some of them need to be identified by the community. When introducing new approaches to the furniture sector, some identified facts can be seen as barriers. To overcome these problems, it is necessary to find out the best new approach. Therefore, it is important to collect a database from the community. It leads to identify the existing awareness and reasons for lack of progressive actions with their experiences.

### **3.2 Questions of Research and Their Achievements**

The research is mainly focused on two matters. They are the barriers facing when implementing new product development approach in Sri Lankan furniture industry and the possible ways to introduce community driven product development within the given conditions in the country. There are identified facts on developing countries in literature review, which can be used for the Sri Lankan context..

The questionnaire is prepared according to the literature and, some identified factors were added to obtain the community's feedback. First part of the questionnaire is specially focused on finding awareness on community driven product development approach and its application at the overall product industry. The second part is to identify the limitations to implement new product development approach with integration to Sri Lankan furniture design and manufacturing industry.

#### **3.2.1 Objectives of section one**

Section one of the questionnaire is focused on related industry professionals and the awareness and knowledge towards product development processes through their working backgrounds and experiences. It is based on their profession, experiences and community involvement through their projects. Accordingly, it helps to collect information of their contribution to virtual community knowledge sharing and social product development. First part consists of 13 questions and is categorized into four different sub areas, discussed below:

##### **i. Identify the profession and experiences in projects**

First three questions are aimed at collecting data about the profession of the participants. Those questions are to collect participants' experiences of handling projects in their working environment and to check whether they have engaged in projects, carried out with customer integration.

ii. **Internet usage and awareness on web based product development**

Question four focuses on awareness in a virtual environment and web based communities. This section generally explores the participants' experiences on web-based environments, working with virtual communities and community driven product development in international platform.

iii. **Involvement on community gathering for product development**

Section three is divided into two sections. The purpose of these questions is to reveal the number of participants who are not involved in consumer-based product developments.

iv. **Objectives on contribution for knowledge sharing projects**

If the participants have engaged in product development, question eleven is to identify their intentions. These are to identify their reason for participation on product development in websites and their trust on an investment.

3.2.2 Objectives of section two



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Questions in section two are specially focused on barriers, risks and opportunities when implementing the new product development concept in Sri Lanka. These questions collect information on causes for barriers, why people are reluctant to involve in customer-driven product development and advantages of implementing community-driven product development in the Sri Lankan furniture industry. Pages 13 to 26 focus on those areas.

i. **Interest in engaging in companies for their projects**

Questions 13 to 16 focus on identifying the reasons for being less progressive or backward to engage with firms to develop products in local. This is to collect data on their further ideas, knowledge and attitudes to community-driven product development companies and check the interest to engage in companies to develop furniture products. Moreover, it is a further check on the availability of their knowledge to engage in different literary identified stages on new product



development process. This stage specially analyses the relevant field experiences with their ability.

**ii. Risks behind the web based approach**

The reason for the less motivation on web based community driven product development in Sri Lankan is discussed in this section, specifically to check their perspectives on developing furniture products with firms. Such as risk on benefits, time investment, ideas going public, cheating, knowledge and interests are taken into account

**iii. Application of globally developed products to Sri Lankan culture**

Questions 19 and 20 focus on identifying the need and application of bottom-up approach at the existing Sri Lankan furniture industry. This will lead to consider the requirements of local industry and existing project management systems.

**iv. Barriers on implementing CDPD in Sri Lanka and its opportunities.**

Next two questions are very important for the overall research. Identifying the critical barriers and strategies to overcome them will be a main purpose of the research findings. It questions their point of view on opportunities of design concepts that are developed to cater Sri Lankan consumers and cultural needs.

**v. Communication and areas that should improve**

Next questions focus on as to what the best communication method to apply in Sri Lankan society and check the barriers on promoting web based platforms in Sri Lanka and barriers to introduce web-based communities for furniture design development in Sri Lanka.

**vi. Identify the suitable methods to implement CDPD**

Final question is to check the best option they can provide to implement community driven product development process in to local furniture design and development industry with the collaboration of international knowledge sharing communities. Six different options have been given to select best suitable method for Sri Lanka.

### 3.3 Type of the research and sample selection

The research is conducted in a qualitative method by getting the feedback and experiences on relevant areas, mainly, by collecting data on barriers and opportunities to identify the critical factors, which were found in literature review.

Sample of the participants was selected randomly among the professionals with 3 years of experiences in furniture and interior fields such as Designers, Architects, Engineers and Quantity surveyors who are graduated from the University of Moratuwa. Especially, the selected Designers and Architects are involved in furniture design, interior design and landscaping projects. Engineers were selected because they are known as the most technically updated people in the country according to their specialized subjects. Quantity surveyors are the experts on material and costing. All those selected professions directly engage in furniture and interior design industry. Above professionals are supposedly aware of technology, material/ resources, new trends, pricing and management systems in furniture design industry. Selecting those experienced professionals as a sample is more effective than selecting mere random users.



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### 3.4 Data Analysis

The selected sample includes 50 responses. 17 engineers, 12 designers, 14 quantity surveys and 08 architects.

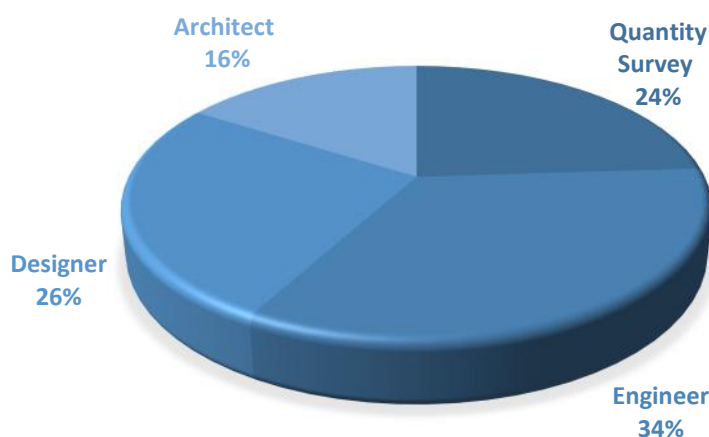


Figure 3.1: Selected Sample of professionals

Among the sample, 58% of them have engaged with projects that take knowledge contribution outside of the company and 42% have not engaged in any such projects. More than half of the people have engaged in knowledge contribution projects that take outside knowledge to their existing processes and some are aware of customer knowledge integration as well as outsourcing for the company. However, their experience may differ from the community gathered environment. Because community gathered product development process is specially a knowledge outsourcing process on different activities according to the needs of firms. Therefore, this finding does not describe the community engagement on product development in a firm but their approach to collect external resources on development of the company or other purposes. However, nearly a half of the sample does not use external knowledge resources in to the internal process.

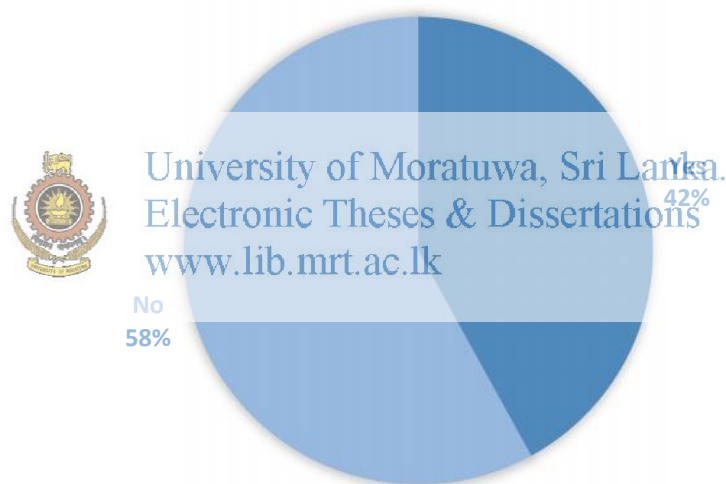


Figure 3.2: Projects taking peoples' knowledge outside the company

Next chart demonstrates their usage of internet. 94% of them are daily internet users, 4% of them use internet 2-3 times a week and 2% of them rarely use internet. It clearly shows that selected sample of respondents are very familiar with the internet and the majority of them are daily internet users. Therefore, their knowledge of internet related things should be higher.

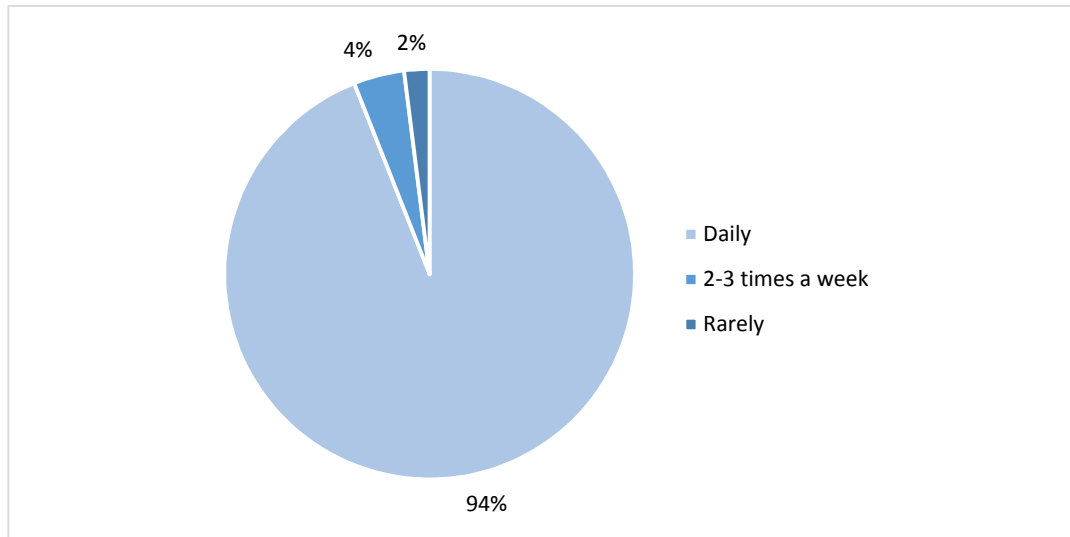


Figure 3.3: Respondents' Internet Usage

Next step was to identify their basic knowledge and awareness about industry related common technical words. According to extent of their familiarity with those technical and common words, it is possible to identify their general knowledge about the industry and application. Selected technical word phrases/terms are:

- Product development
- Community driven product development
- Social product development
- Virtual communities

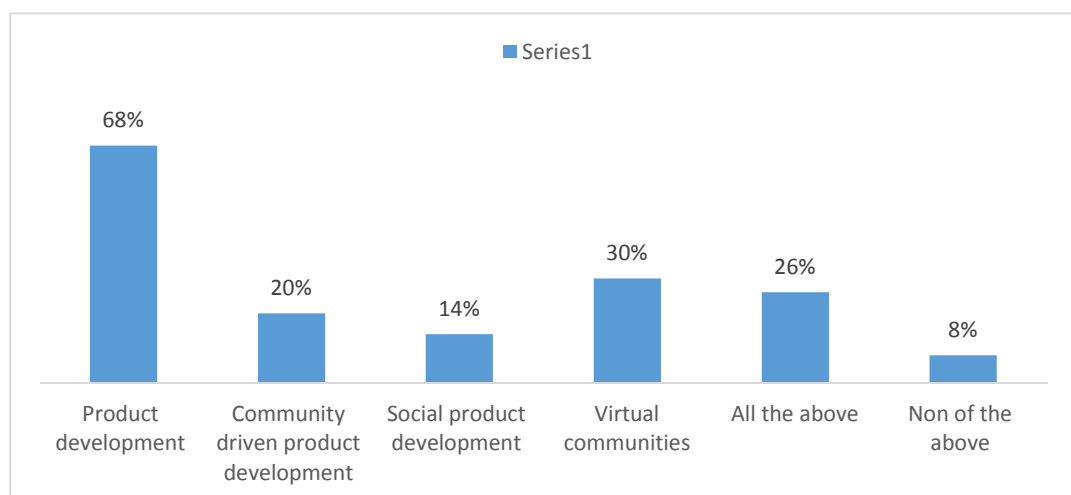


Figure 3.4: Awareness on technical words in NPD

Interestingly, 8% of them were not familiar with any of above terms. It is an unexpected issue as far as their professional knowledge is concerned. If this sample of participants state that 94% of them are familiar with internet and but they are not familiar with the word product development and web related product development activities that should be a factor to consider. 26% of them are familiar with all of the above and majority of 68% know about general product development. 30% of them are familiar with virtual communities. However, only 14% and 20% of them are familiar with social product development and community driven product development. Most of them might have experienced this process but they are not aware of names and technical usage. New product development theories and web-based approaches are well known internationally but not locally. This reaction of the professionals indicate that if a graduate professional is not aware of such terms related to customer-driven-product-development, the local general public may also not be aware of them.

Next question leads to test their awareness on internet business or web based working environment. This is to identify how familiar they are with different virtual communities and their experiences.



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These findings specially indicate that majority of them are extremely familiar with social web sites. That means majority of them are gathered to a virtual community even if they may be unaware of the terminology. Goods purchasing, internet blogging, product developing and freelancing is not familiar as social web communities. It demonstrates that main web and internet usage of them is to engage in social community activities through Facebook, twitter, Google and emails.

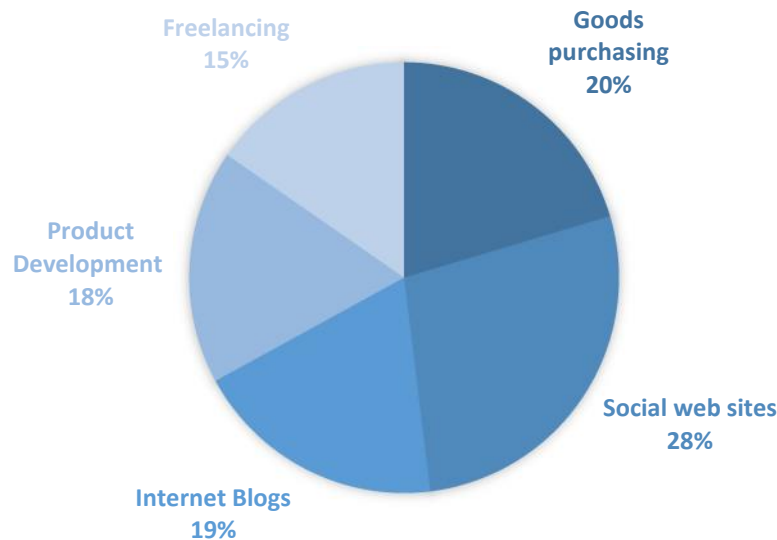


Figure 3.5: Familiarity with different web based activities

Some of the professionals, who participated in the survey, live abroad. They may have some other communication methods.

According to the survey, the least familiarity is with freelancing and product developing web sites. Moreover, if they are not familiar with product development web sites it explains that they are not familiar with social product development sites either. Again, that might be a reason of not knowing the word terms because they are not updated on those web based activities. Therefore, categorising according to the profession and checking the awareness on such terms will help to get a clear feedback on product development process.

Therefore, the next question is targeted to measure their awareness about some famous community-driven-product-development web sites in the world. It is needed to pay for some of those websites to participate in the process, some of them are free to participate and although they allow accepting projects and earn. [www.quirky.com](http://www.quirky.com) has a long process of idea generation until pricing the developed product and [www.kickstarter.com](http://www.kickstarter.com) is only for Americans. However, those web sites provide opportunities for the inventors and developers. Those are the main reputed web sites

for community gathered product development. Awareness about them demonstrates that the sample of graduates engaging on community driven product development process. If they do not have any experiences on those, it not only indicates that they have not engaged in web based product development but also indicate that they have not experienced such world famous web sites.

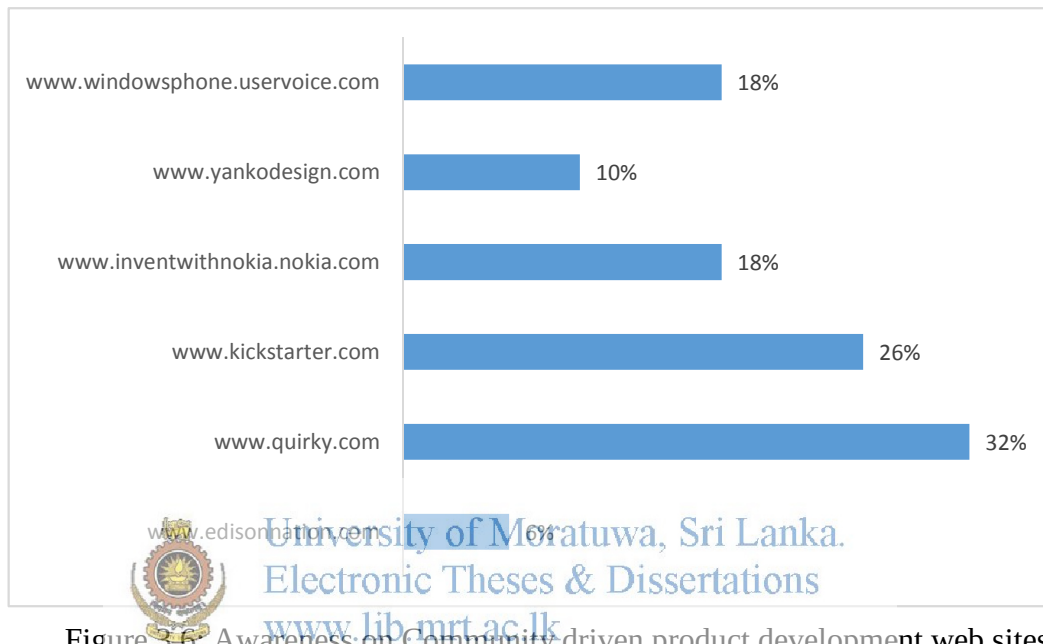


Figure 3.6: Awareness on Community driven product development web sites

Edison Nation' is one of the oldest sites for inventors and it is one of the leading and reputed customer gathered product development web sites. Quirky is a growing new web site with 4-5 years of history on gathering community people on their idea invention, research, design development, testing and pricing categories. In addition, they provide space for members to add their innovative ideas, divide a percentage of their profit among the members and buy their products. Kickstarter.com is a web site for US citizens that develop consumer ideas and comments. Parallely, consumers can invest on best design projects and they can earn when the product goes to the market. Invent Nokia is the web site for the world famous 'Nokia' mobile devises development according to consumer feedback and new inventions. Yanko Design is a Japanese web site that develops new consumer products with more designer input. Windows Phone User Voice is a new web site started by Microsoft to get the

consumer feedback on their new series of windows 8 mobile phone devices. Names of those selected international web sites are used to check the respondents' awareness of the industry

Among them, 32% of them know about Quirky and 26% know about Kick-starter. Few of them know about Edisonnations and Yanko design. As an average, they are familiar with Nokia and Microsoft mobile development web sites. These results demonstrate the awareness of benefit providing web sites in product development. Both high ranked web sites pay for the influences in different platforms or give opportunity to go through new ideas and choices of members. Some of the other sites cater the producer requirement by using community knowledge on their development. This indicates that consumers look for benefits. They look for a value for their spending time than using it as a form of volunteer support.

Further, some of them mentioned about some other product development sites that they are familiar. Those are [www.instructables.com](http://www.instructables.com), [www.etsy.com](http://www.etsy.com), [www.graphicscompetitions.com](http://www.graphicscompetitions.com). Those are instructorless community driven product development sites but earlier mentioned web sites are involved with selling and competition too. Some of them engage on different projects in practice by actual manufacturers: for example, Roof Combo water proofing systems, Hadley steel framing system in their company projects. None of them specified about furniture and interior or architecture related product design projects parallel to their industry. This means some of the participants have experienced web-based communities and product development projects that use consumer feedback within their firms.



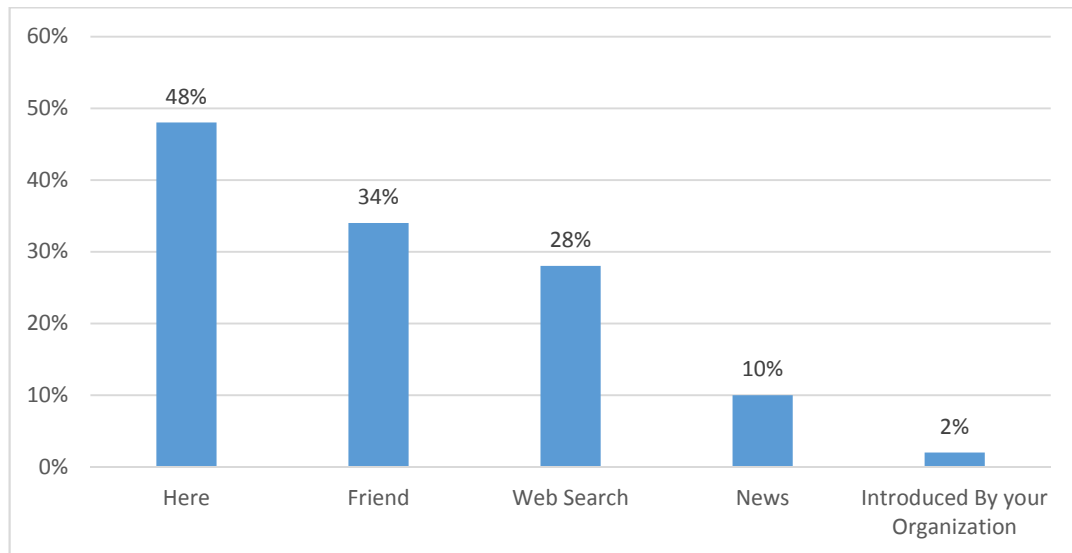


Figure 3.7: Awareness on selected CDPD web sites

This demonstrates they are knowledgeable about management processes and functions but there are less opportunities or publicity on those international communities within Sri Lanka which still is a country without high-internet penetration and has a developing economy.



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34% of them are connected with those web sites with the guidance of a friend and 28% of them by web search. The positive word of mouth is one of most effective web recommendation system for e-business. To find a site by web search is random or industry-related. However, referral system is based on recommendation and trust on past behaviour. 48% of them have heard about those web sites for the first time. Therefore, there prevails an issue about awareness on those web-based platforms in new product development approach. The fact that 48% of university educated Sri Lankan society is not familiar with new customer driven product development trends in the industry is another negative point. It might be because of professional subject scheme and industry is not related to new product design and development or their project criteria. It is massive and critical to develop by using simple web platforms. Therefore, it is possible to get an idea about overall awareness of consumer product development through this sample but not an overall idea on their related working environments.

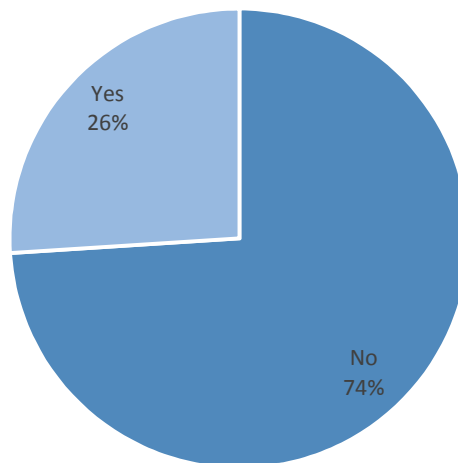


Figure 3.8: Submit ideas, support or invest on web based PD activities

Some of the participants are members of mentioned web based product development communities and they engage on community projects in many ways. It indicates they are not only familiar with those web sites but also are members of such communities and have contributed their knowledge to them. 26% of them are already active on those web sites and other 74% are not engaged or supported in any customer driven product development project conducted through the internet. Again, a lack of participation demonstrates a need of awareness in Sri Lankan educated society to acquire their knowledge in to development processes before introducing to the public through the internet.

In the local context, some of them have participated in projects that gather community support in their projects in construction, precast pods, cement and fashion industry. This is a kind of positive approach to the industry with their knowledge contribution on different construction and design projects locally. Again, there is no furniture related activities indicated. Web-based approach is similar to consulting and sharing knowledge on a virtual platform. Therefore, it is not applicable for every industry until it is practiced. However, in some project stages in furniture industry, innovative concepts, comments and testing experiences are needed for further development.

Next question is focused on their personal view of contribution to virtual communities on product development. Everyone has their own thoughts and beliefs on those new approaches. People are busy with their everyday work and office work. Therefore, they have to have a good reason to contribute their knowledge and spend time on a community. Though some of them are busy, still they find time to spend on knowledge sharing and community gathered product development without expecting profits. This demonstrates expectations and availability of paid and unpaid expert knowledge in to the development process.

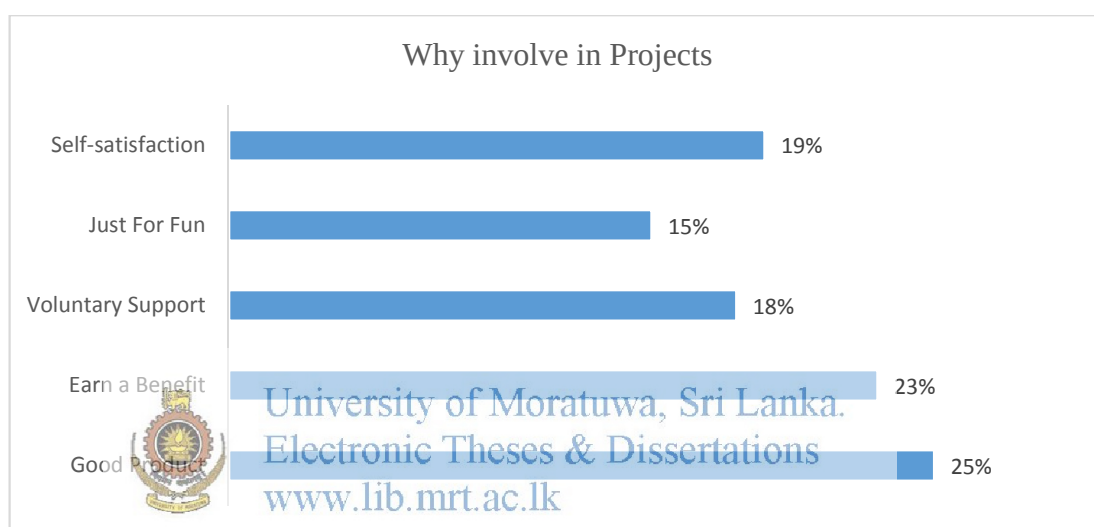


Figure 3.9: Reasons for participation on virtual communities

As the above chart shows, the main objective of everyone is to make a good product. Majority of them is given rate five on good product and earn a benefit. Self-satisfaction is the third. As busy persons, and who search good lives, they select good products first, instead of self-satisfaction and earning through community driven product development. Although the professionals select good products, feedback of the general community might be different.

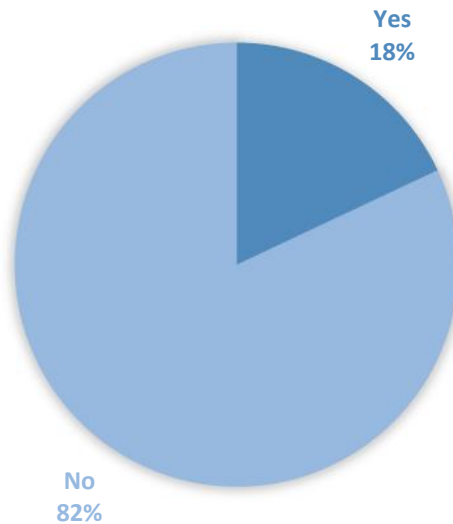


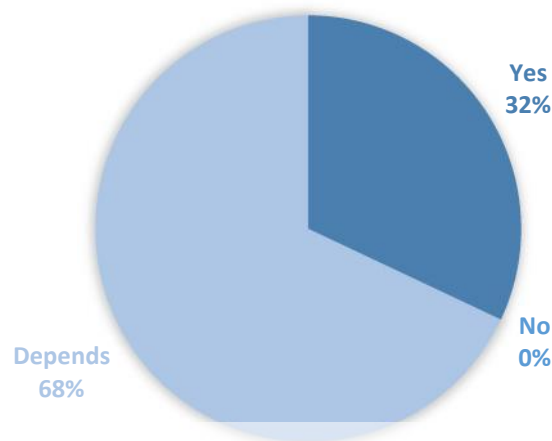
Figure 3.10: Whether look for quick benefit

The selected sample already has an occupation and is not in a hurry to get money from the product design communities. Therefore, 82% of them do not look for a quick earning from participating in CBPD. That might be the main reason that they take product design process as a long-term investment. However, the results may vary with the general community and with experts who contribute their knowledge for product development more.

The second section of the survey focused on local culture and possibilities of applying community driven product development in to the Sri Lankan context and developing furniture products. There are some identified facts related to the developing countries in literature and some of them are used in relevant questions to check their application in the local context. Most international methods used for developing countries are not completely applicable for Sri Lanka. This study will help to analyse the application of Sri Lankan culture and available opportunities CDPD into furniture product design and development.

First question is on their knowledge and experiences on CDPD firms or companies in Sri Lanka. Although every selected professional is from four different fields, which are related to furniture and interior design industries, only few of them replied to this

question with their own experiences. More than 94% do not know about the industries that use community ideas on their product developments in Sri Lanka. One indicates furniture industry and other two indicate fashion and construction industry. It is a major negative point found from the survey. Companies might not be focusing on customer driven product development to get influence or there is an issue or barriers to implement with their ongoing industry.



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Figure 3.11: Giving the contribution on companies' Product development process

Contributing knowledge to web-based communities is not possible always for the selected set of professionals. They are engaged in the companies or firms that they work at, they are obligated to keep company secrets and some of them value their knowledge. However, everyone in the selected sample is ready to contribute on new product developments with or without conditions. 68% of them answer that their contribution depends.

Next step is to identify the reasons for being reluctant to contribute ideas to companies and product development. Their feedback is gathered through the facts such as trust, benefit, and time, what they get return on investment, risk, chances, and opportunities.

To contribute valuable ideas to an intangible virtual community there should be trust. Above charts demonstrates that they have critical issues with trust and time. According to the current society, when they hear about idea stealing, it is fair enough to have issues with trust.

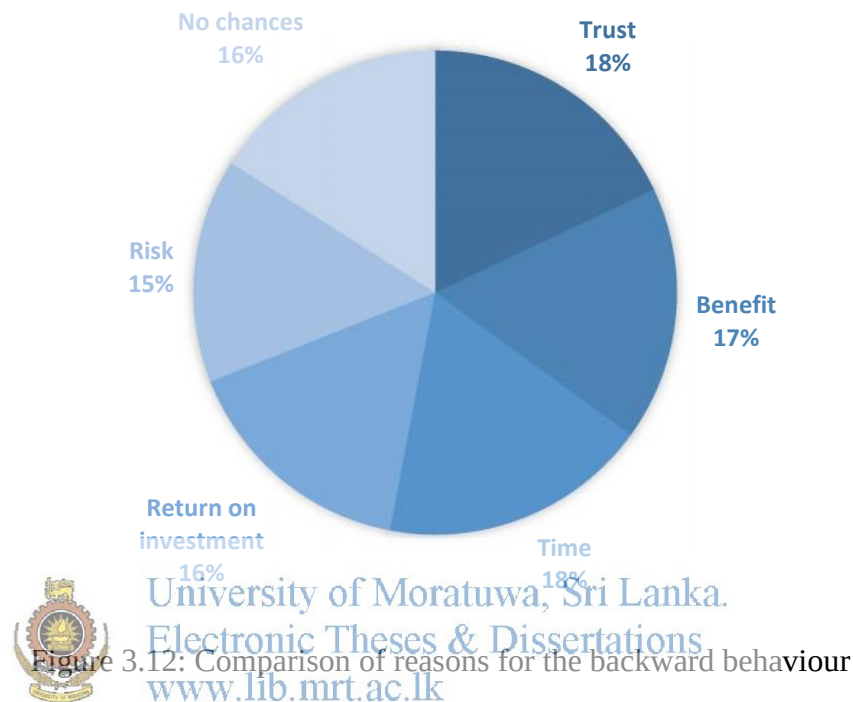


Figure 3.12: Comparison of reasons for the backward behaviour

Time is value and time is money. Everyone value his or her time. Time consumption of such projects has become the second barrier for them to engage in companies to contribute their ideas.

Third fact is risk. Some mentioned about some companies, which develop products through consumer gathering and they have started different new brands not as an extension of existing reputed companies. Therefore, people feel insecure about such brands and companies especially on their ideas and money that they invest. Therefore, those firms and companies should build their reputation and spread it.

As mentioned in literature, some companies and firms provide benefits in return. Such as percentage from their profits and letting the community members to buy products at discounts. As motivation, people need such benefits. According to the

survey, forth reason is not getting benefits or lack of benefits. International community and some of the locals get benefits on community driven product development. No benefit means less contribution.

Especially for some subject areas, knowledge contribution of professionals is more valuable than knowledge contribution of general community. If the return on their time investment is not beneficial, professionals will use their spare time on some other work rather than working for product developers.

‘No chances’ is some others reply for not contributing on companies and firms. It represents that they believe that there are no chances for them to contribute or there are no available companies to engage with community gathered product development. Then it becomes a communication issue.

Furniture design can apply the bottom-up design approach. Steps of design process are started with idea generating, research, design, branding, testing and pricing. Each step comes after another. There are some minor steps in between above steps. However, the sample of people is asked how they can contribute throughout the main steps with their existing knowledge. Designers and architects are more familiar with design and development, Engineers are more familiar with production and development and quantity surveys are more familiar with selecting best materials according to cost.

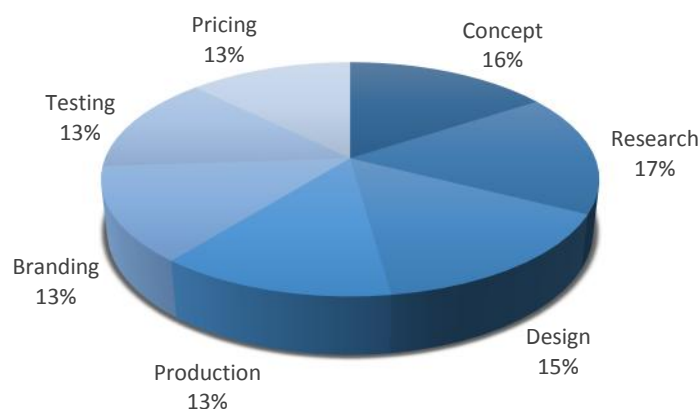


Figure 3.13: Best suitable stages to contribute knowledge by selected professionals

There are identified several stages that many can engage with product developing process such as concept, research, design, production, branding, testing and pricing. However, expertise will depend on the area they work. Therefore, it is needed to analyse the expertise areas of the selected sample.

Charts prove that most of the people can engage to develop concepts and research. In research stage, more effort does not needed and many people can contribute with their experiences. Creative minded people are needed to involve in concept development and design. However, the willingness to contribute to production, branding and testing remains quite less. Many people state that, it is difficult to contribute ideas about pricing because, pricing a new product that yet to be ready to arrive market is different from product prices that are already exist. Many companies search for the contribution of community members to price their products within the product development process because they want to check the prices that consumers are willing to pay.

This overall study provides a general idea on involvement into the design process. However, people related to different field are in the sample and only designers and engineers are expert on product design. Each profession might have a different perspective. Therefore, they are divided according to the profession.

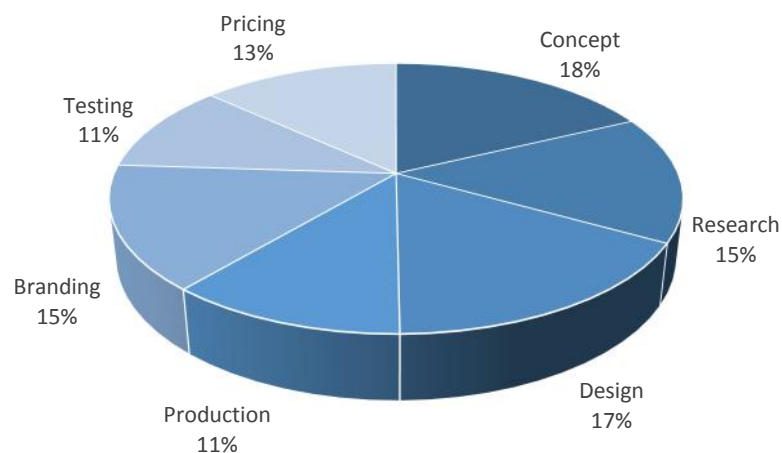


Figure 3.14: Input of designers on different stages of PD



The collected data indicates that the designers are less progressive in production and testing stages. Production and testing stages are the stages that needed the technical and engineering knowledge than aesthetics. Therefore, the reaction of engineers might give another perspective on this.

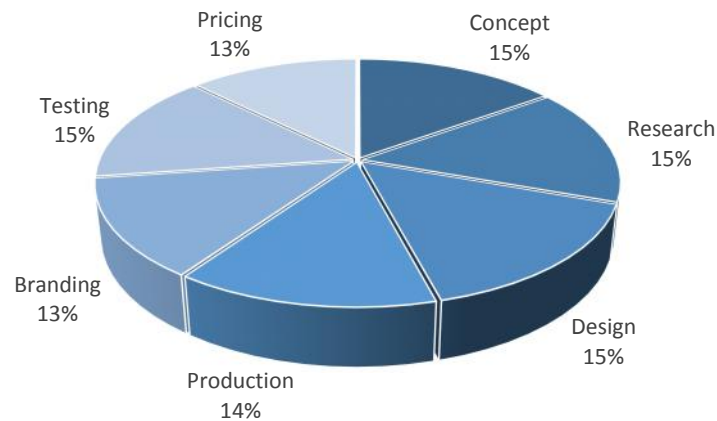


Figure 3.15: Input of Engineers on different stages of PD

From the collected data, it is evident that engineers provide more feedback than designers on production and testing. However, their feedback on design and branding is comparatively low because those areas are more aesthetic than technical. Engineers are technically oriented professionally and their input on aesthetic things can therefore be low. Both can involve on research and pricing equally.

Only a few companies price the products according to the feedback of the community. Still the community waits with the same traditional perspective until the firms decide the price. However, according to new product development, the price that the customer is willing to pay will be the price of the product.

Next step is to identify why consumer driven product development rarely takes place in Sri Lanka though the professionals are willing to contribute. The criteria are: less awareness, search for quick income, issues with time consuming, benefit on spending time, complex, trust on companies, charging of web sites, trust on people, intellectual

property rights, ideas exist, interest and knowledge on design. Questions are prepared according to the findings of literature and the knowledge of experts.

This analysis demonstrates that, in Sri Lanka, the awareness is less about community based product development processes. Moreover, there is an issue with trust on other people in virtual communities. Idea copying and cheating is the most common issue in product design industry. This issue exists everywhere in the world.

This survey results shows there is a need of a better patent and copyright system, which is recognized both locally and internationally. Lack knowledge, interest on design, prevalence of ideas, the need of a subscription fee to initially involve are rated accordingly.

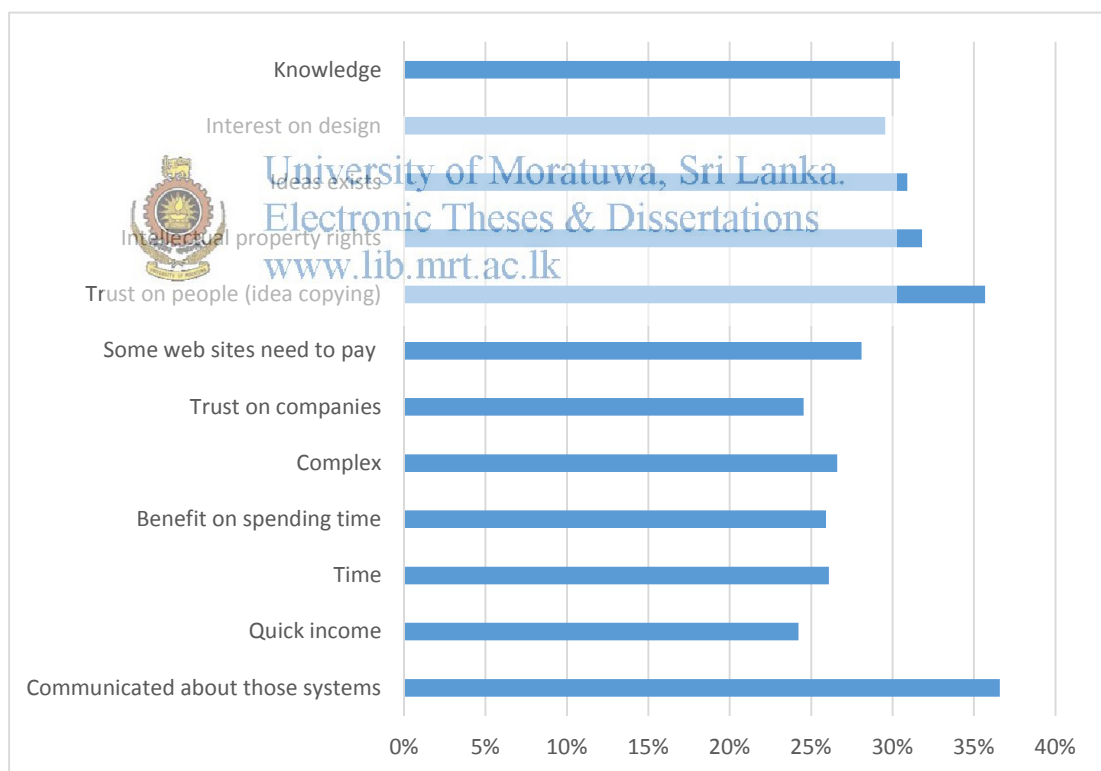


Figure 3.16: Reason for Sri Lankans not to involve in CDPD

Not getting a quick income, no time to spend, not getting enough benefit, no trust on international companies and complexity of the process is rated lower than other issues.

According to the earlier answers, it is identified that most of them have an issue on risk and trust in their mind. Therefore, the following question was asked to identify the types of risk that they face when involve in PD through internet. Less beneficial, Busy and no time for work, Ideas going public, Idea copying, No knowledge and no particular interest were the given options.

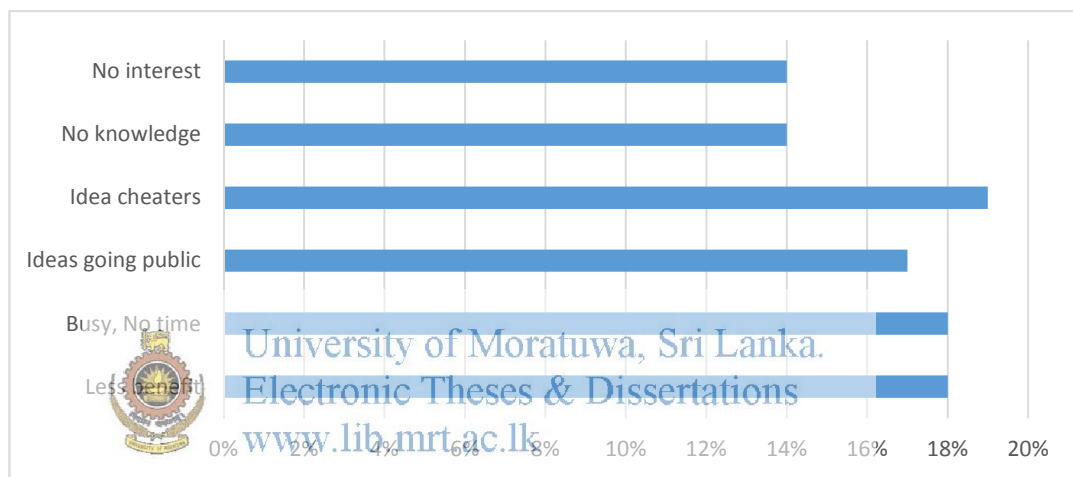


Figure 3.17: Comparison of risk behind the web based approach

Again, idea cheating becomes a critical factor. Time issue according to busy lifestyle and less benefits ranks next. The selected sample of experts believe that the knowledge and interest on design is not that much of a risk for Sri Lankan community.

In above stages Sri Lankans approach on community driven product development, its opportunities and risks is discussed according to the internationally recognised factors. Next section focuses mainly on implementation of web-based approach in the local furniture design industry. Before that, the selected sample is asked about the suitability of internationally developed designs and products in the Sri Lankan context. However, the view of professionals may differ from that of the public.

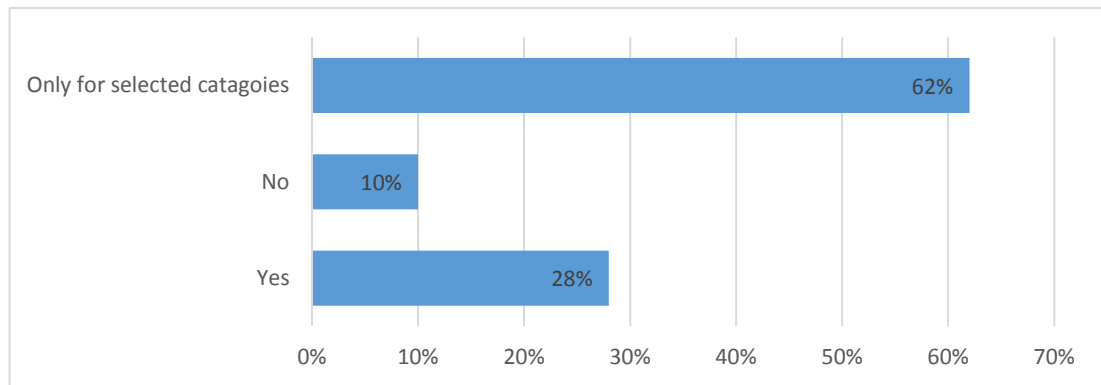


Figure 3.18: Suitability and catering internationally developed products to the Sri Lankan requirements

62% states that among internationally developed products, only selected categories are suitable and cater the local requirements. 28% states that all the products are suitable and cater the local requirements. 10% states that none of the products caters the Sri Lankan requirements. Chinese furniture manufactures develop the products with customized ergonomic requirements for different cultures. Majority states that it depends on the product and the category of furniture. It highlights the need to develop products through universally suitable web based product development in order to meet the requirements of the users.

As far as the application of community support on product design process is concerned, it is necessary to identify the existing application of system in local context. First, it is important to analyse the awareness about web-based approaches and ability to practice them in local industry. The contribution on design and production chain functions from bottom to top in the industry. Usual top to bottom approach already functions from the beginning of industrial culture. However, bottom to top management system is still new to the local industry.

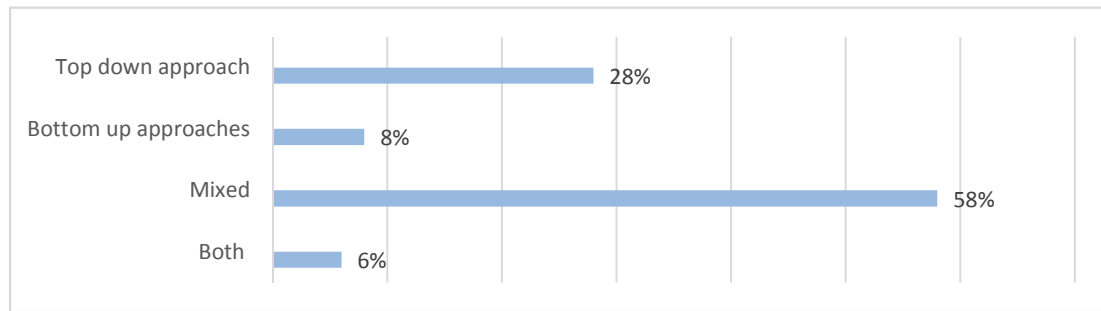


Figure 3.19: Current approaches in the companies

The graph demonstrates that most industries have a mixed approach. 58% of the companies use the mixed system in their industries while 28% use the traditional top to bottom approach and only 8% use new bottom to top approach. For example, the existing furniture industry gets suggestions from suppliers and carpenters about some issues on materials, joineries etc... Alternatively, they research and test.

Next step is to identify what limitations and barriers affect the implementation of the community driven product development to Sri Lankan industry. Questions are based on the facts collected from literature and generally accepted norms. They were intended to gather an overall idea about both practice in local industry and virtual communities.

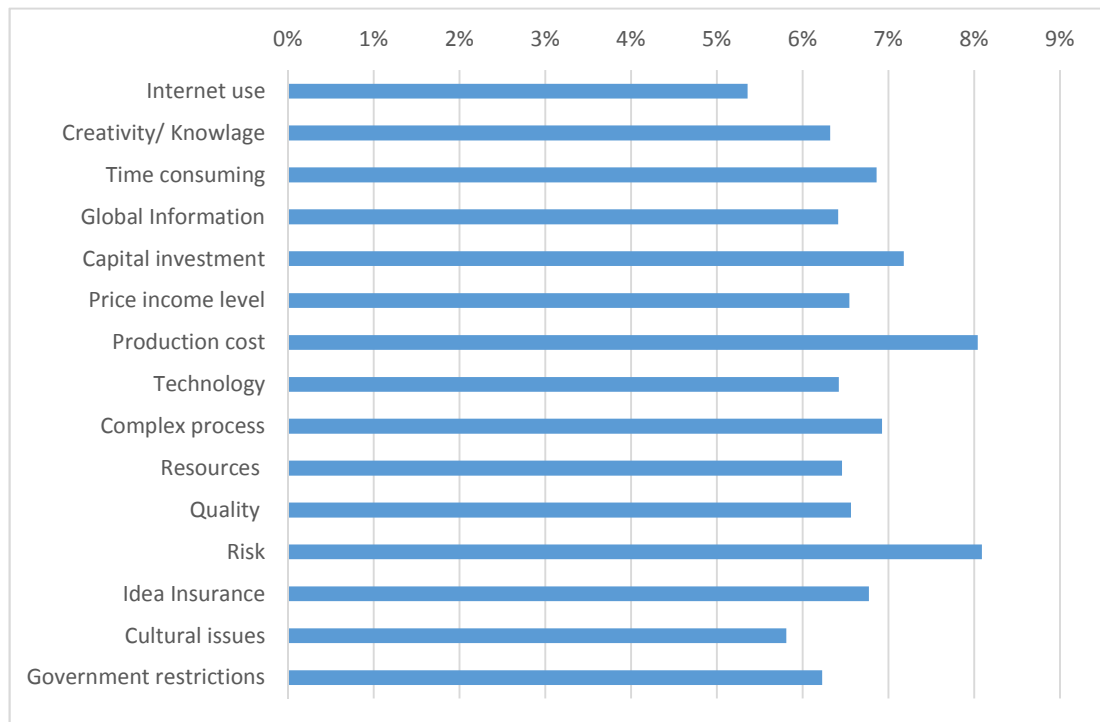


Figure 3.20: The critical barriers to implement NPD in Sri Lanka

Identifying the barriers and apply suitable solutions is a major purpose of the study. According to the above chart, risk and production cost are the main issues when introducing NPD in local context. Time consumption, complexity of the processes, finding the capital investment, insecurity of ideas and low income level are rated average. Finding resources, technology, quality, knowledge, government impact, cultural problems and less internet usage are identified as minor issues. It is important to identify and analyse above barriers when implementing NPD in Sri Lankan furniture industry.

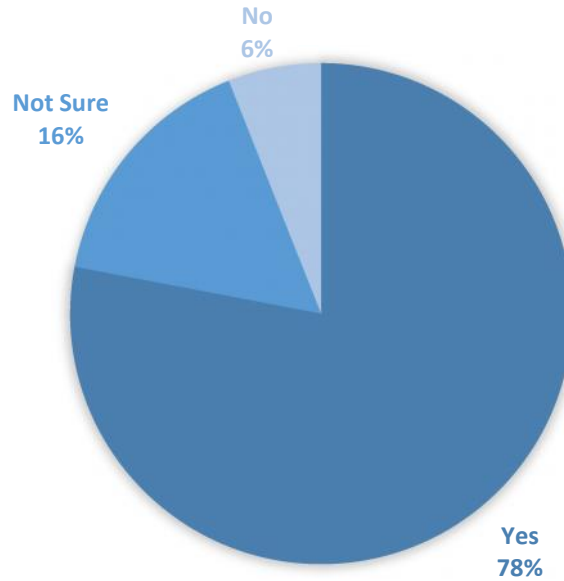


Figure 3.21: Necessity to develop or redesign furniture products for Sri Lankan culture

Among the selected sample, 6% of states that it is not needed to develop or redesign new furniture products especially for Sri Lankan culture and 16% states that they are not sure whether it is needed. However, 78% of them states that it is needed have furniture products especially for Sri Lankan culture. Though there are limited opportunities in the country, in terms of their professional experience, they state that it is possible to develop new furniture products or redesign existing products for the requirements of Sri Lankan culture and ergonomics.

Next objective is to identify the best suitable communication method that easily reaches the community. Through TV, Internet and Web, News Papers, Mobile apps, Firms and Companies, Organizations and Institutes, Schools and Universities are the existing ways to give a message to the community. However, some media fails to reach the community with daily updates and discussions.

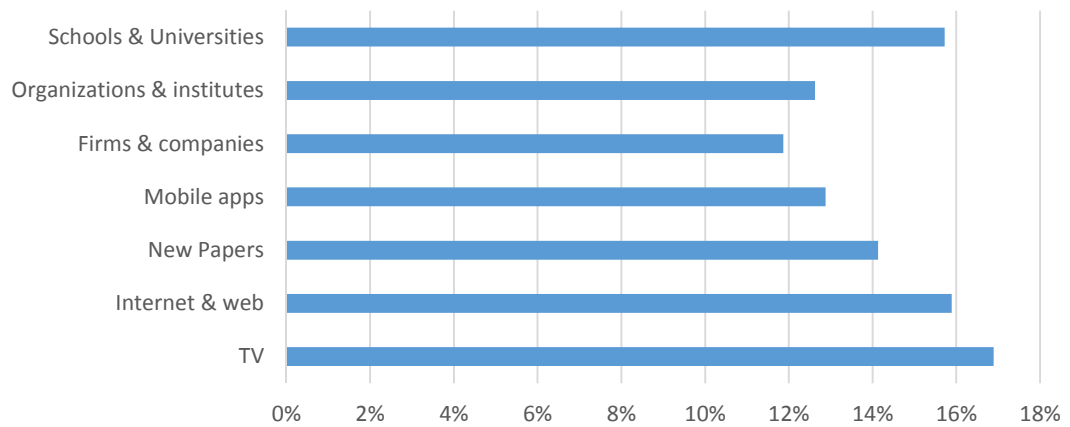


Figure 3.22: Best communication method to create local awareness

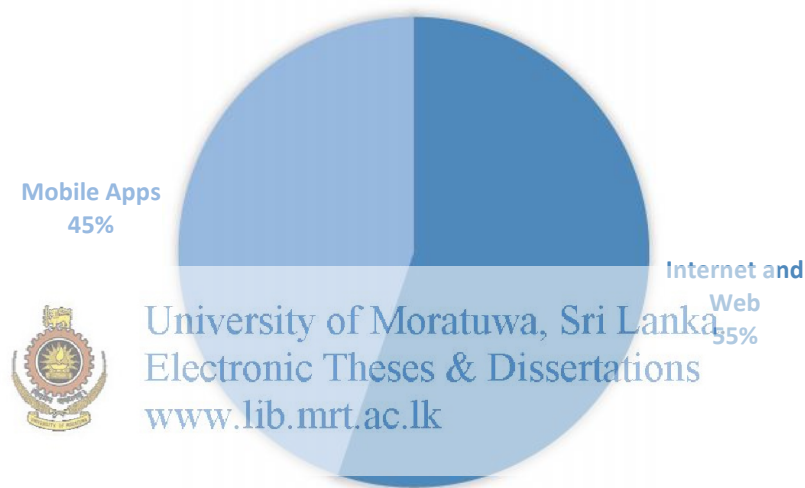


Figure 3.23: Internet and Mobile app comparison

Earning depend on the contribution and return on investment. Many people like to freelance and earn extra amount and there is no appropriate and fixed time. Therefore, Internet and Mobile apps are more convenient to use in community based product development because it is easier to access, communicate with two people or more at the same time and it updates information changes within less than a second. In this regard, compared to mobile apps, the internet is at the top. Mobile apps are yet to be developed according to the standards and functions of the web. Most companies make mobile apps as alternative support for their web users. There is a new trend among young Sri Lankans for using smart phones and tabs. Therefore, the young crowd is more attracted to mobile apps.



Though the internet becomes first in communication as it reaches people with every update and letting them the opportunity to have a glance, Sri Lankans are less familiar with web-based community driven product development systems. Next chart will be helpful to identify critical factors on communicating new trends for general society.

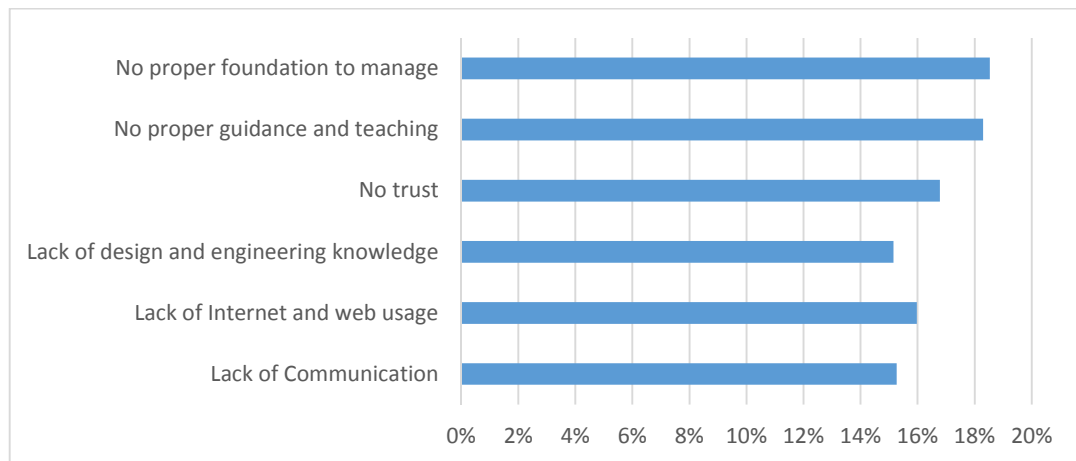


Figure 3.24: Reasons of the Sri Lankans to be less familiar with CDPD



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Lack of Communication, Lack of Internet and web usage, Lack of design and engineering knowledge, No trust, No proper guidance and teaching, No proper foundation to manage, are the factors that mainly concerned. No proper foundation to manage and no proper guidance and teaching have been rated as most critical factors. It demonstrates the limitations, lack of guidance and less awareness about information technology in Sri Lanka. There is no proper foundation to manage the community-gathering platforms. Not properly organized design firms are available for community driven product development or web based virtual community driven product development in the country. Trust is the next issue when it comes to implementing web-based approaches in the Sri Lankan context. Lack of internet usage, lack of design and engineering knowledge have been rated average. Lack of communication is a minor factor in the local society. Again the above feedback indicates issues in typical educational system and awareness of people as well as organizational issues arising under the interest and trust.

The discussion so far presented the barriers and how they effect when implementing community driven product development approaches in the Sri Lankan furniture industry. Therefore, it is necessary to identify the suitable ways to develop the products for Sri Lankan context and the way they reach the consumers. In addition, the findings are useful on implementing the web based product development approach in existing Sri Lankan furniture industry. Finally, it is needed to check the availability of product development process that gather people and communicate well. The process might engage internationally functioning social product development approaches customised to suit the industrial context in Sri Lanka.

1. Develop traditional concepts according to modern requirements
2. Develop substitute concepts for Sri Lankan context
3. Develop products under the limitations
4. Engage people with existing firms on their product development process
5. Engage with global virtual communities for product development
6. Organize virtual communities to fulfil Sri Lankan requirement

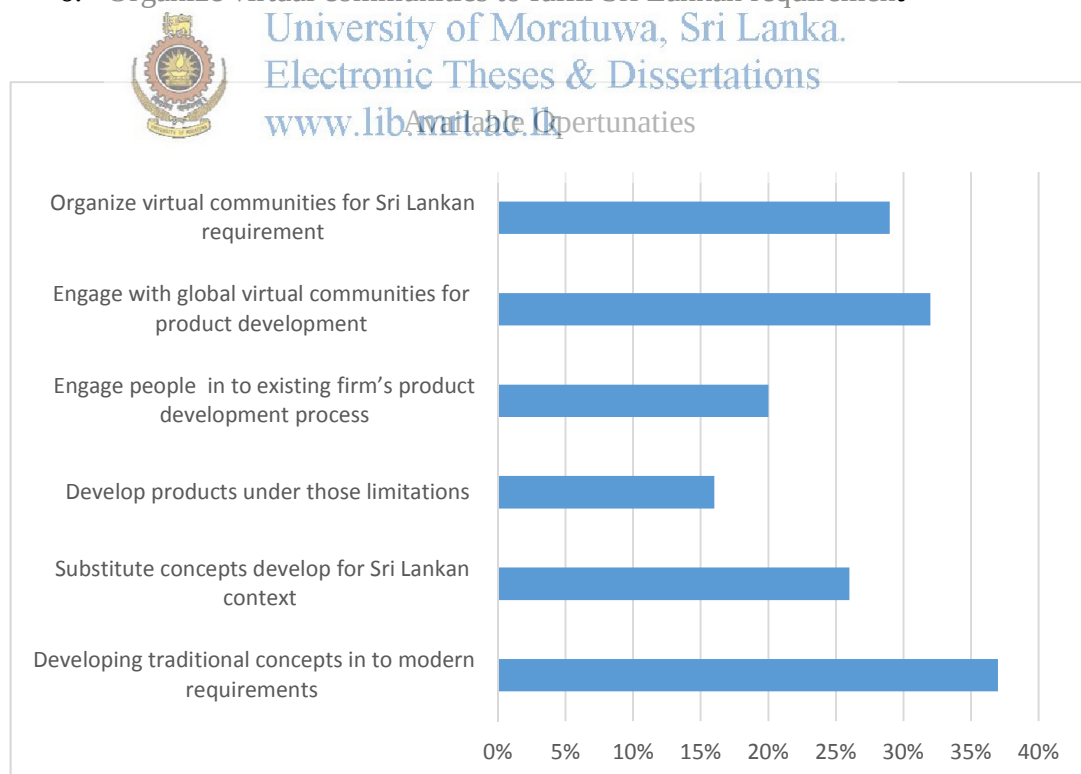


Figure 3.25: Available opportunities on implementing NPD

The final data collection was to check whether the selected set of sample of professionals would like to see a change in the existing Sri Lankan product development system or whether a new approach that is integrated with the tradition is needed. The feedback highlights the need to adopt traditional concepts to modern context and popularize them among international communities. This is a positive result on NPD for the future furniture industry.

### **3.5 Summary of Outcome**

All the data was collected from professionals from the related industries such as engineering, designing, architecture, quantity surveying, town planning and IT and they can be important contributors in any product development process. Among them, all the engineers and designers are more related to consumer product design processes. Therefore, designers and engineers are consulted more to clarify the result.

First section of the questionnaire and analysis of the collected data specially indicates the awareness of CDPD and reasons for not being familiar with the Sri Lankan society. Second section focuses on implementing NPD in Sri Lankan context.

As a conclusion, more than 94% of professionals are internet users and majority of them are very familiar with social web sites. However, the awareness is less on web based communities and product design companies that use NPD in their production processes.

Majority of the local companies use a mixed approach in their working environments and few use bottom-up approach. Trust and time are major barriers to contribute ideas for community driven product development process. However, the participants were willing to contribute their knowledge for a better product. As a collection of professionals, majority of them are ready to support on concept,

research and design stages of PD process. Engineers are more interested in testing and production stages and designers are more interested on designing and branding. According to the view of the participants, Sri Lankans are reluctant to involve on web based PD because of the less awareness, no trust on people, Intellectual property issues and no interest. They do not search for a quick income, benefit for time consuming or knowledge they contribute. However, time allocation and protection of ideas from cheaters is identified as most critical factors.

Similar to the reviewed literature, the selected sample indicates that the entire international furniture products are not completely compatible with local conditions. Especially, because of the ergonomics are different between Europeans and Asians.

Risk and production cost are the main issues when introducing NPD in to local furniture industry. Time consumption, complexity of the processes involved, finding the capital investment, insecurity of ideas and income level are rated average. Finding resources, technology, quality, knowledge, government impact, cultural problems and less internet usage are identified as minor issues.



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Best communication methods to reach the public are TV and newspapers but best way to implement NPD is via internet. Non-availability of proper guidance and organized firms is a critical factor to implement customer driven furniture designs in Sri Lanka.

Finally, the findings demonstrate that it is necessary to adopt traditional concepts to the modern context and popularize them through international communities. This is a positive result on NPD for the future furniture industry. However, nobody seems to be ready take the first step for such development in the country.

#### 4.1 Key Research Findings

##### 4.1.1 Literature Findings

There are two different PD approaches used in the global context. One is the Top-down approach and the other is Bottom-up approach. NPD based on bottom-up approach with consumer integration to the product development process. Some international companies that follow the bottom-up approach in their design and development process are integrating consumers to NPD in different stages in product development through virtual communities. This product development through customer integration is called community driven product development. External sources for this procedure are identified as Inventors, Lead consumers, designers, engineers, other pioneering community members and heavy users.



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Communication among the virtual communities through the internet and texting, instant messaging, email, blogging, virtual worlds and social networking provide a rich platform to communicate among people. Forums, chat rooms, message boards, instant messaging, guest books, mailing lists and group calendars are the most commonly using tools.

Customer integration to furniture design can be practiced at different stages of the process, idea generation, research, concept and design development, prototyping, pre-launching, testing and pricing. Some consumers give their volunteer support on developing products but there should be a motivation for everyone engage on production process.

Knowledge about customer needs, idea security, positive word of mouth, are some key facts for firms when developing a product with customer integration. Developing countries are always behind in knowledge on technology or resources. Firms are reluctant to implement innovative products in to developing countries because of their small market potential and affordability. They try to modify their products into local conditions.

Prevailing rules, norms, values, culture, ethics, common goal, territory and also age, unit size, education, income, gender, profession, location, department behave in different ways when implementing new things in to different countries.

Price income levels, technology development issues, capital constraints, creativity as country issues, return on investment, purchasing power, resources, technology, material, capital leads impossible to develop new furniture products in developing countries under consumer driven approach identified as some barriers face when implementing NPD in developing countries.

 The first part provided an overall discussion about consumer driven product development approach in different industries and applications. The part focused specially on furniture products applying the consumer driven approach to the specified furniture design industry. In this section, customer needs, common issues and problems causing in furniture products were discussed. Some local industry information related to the Moratuwa area also discussed in brief. Some useful information on updated technology usage and marketing strategies were also found.

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Those identified facts were taken forward as a source of data for the questionnaire survey on special application to the Sri Lankan furniture design and manufacturing industry.

#### 4.1.2 Analysis findings

A series of specified factors that effect on implementing NPD and SPD for developing countries earlier identified by literature survey. The differentiating of cultural effect identified by applying those identified factors to local context. Facts categorized in to 25 different questions with the hierarchy of awareness to implement furniture design in Sri Lankan context.

The research focused on how this impacts the Sri Lankan people and their social context with key contributors of industry professionals, in Engineering, Architecture, Design, quantity surveying fields. Those people are one of the most updated community in the country about the newest updates and technologies on furniture industry of the world other than the public. Therefore, most of them have better linkage with furniture products in their industry and easily express everyday experiences.

First part of the analysis discussed how the awareness on NPD and its process. Most of the respondents engage in project in their related industry. However, they apply the community approach of customer feedback on their industrial process. 58% are using external knowledge sources. 42% had not engaged on such projects.

Most literature confirms that developing countries face challenges with internet penetration and communication issues among their financial and technological issues. However, the selected community was found to be somewhat different in terms internet use. This research found that 94% of them are daily internet users and having some knowledge about PD, but lacked knowledge on key words related to NPD and its gathering platforms. 26% knew about all mentioned. Only 68% of the total knowledgeable about PD. Most of the contributors were less familiar with the words such as virtual communities, social product development and community driven product development. All know the above are less than 26% from the total. 8% of them were not familiar with any of those.

Awareness on internet based business and product development web sites was also found to be poor. . Most of them were, however, extremely familiar with social web sites and internet blogs. Familiarity on product development, freelancing and goods purchasing sites was relatively limited. Their awareness on international web site related to NPD is less. It is less than 32% of total for each. Majority found those sites by referral of a friend or web search and few of them are members. 26% were already connected with those with idea submission, influencing on projects or purge or invest and rest 74% were not. However, 48% of hem heard about those web sites for the first time and few people are members of some other PD related web sites.

Majority of the sample's preference is to see a good quality product and earn a benefit from their contribution. When they contribute to the NPD process, majority did not look for quick benefits. Only 18% looked for quick benefits. Producing a good product and long-term benefit as well as self-satisfaction become more important for the contributions. Findings show support for voluntary or fun in international context is not much applicable for this context. Few of them already engaged with community gathered projects in Furniture manufacturing and "Long land clothing company".



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Second stage of findings focusing on application and implementation to the Sri Lankan context. First, found why they are backward on giving their idea contribution to companies' PD and the stages they can engage. Everyone likes to contribute their knowledge and 68% are depend on their conditions. They have a critical issue on trust and time consuming. Trust on company reputation and risk on investment became leading backward points. Benefit and return on investment becomes minor and they agree they have enough changes available to engage on.

Contribution to the furniture design and development process generally discussed and everyone like to engage on concept, research, design and production. However, backward in branding testing and pricing stages. When considering the special category of designers they are less progressive in production and testing. Engineers are forward in design, research and production stages.



Next, check the reasons behind Sri Lankans are backward on involving internet through product development projects. Awareness on those systems and trust on people became most critical issue. Knowledge availability, existing ideas, intellectual properties, some web sites need to pay and interest on design became medium critical. Trust on international companies, complexity, time availability, benefit on spending time and quick income became minor factors. At the same time identified what kind of risks they face when engage with international PD through internet. Idea cheaters, less benefit and busy no time are more critical. There is no issue with interest, knowledge and ideas going in to public.

62% availability for develop products for Sri Lankan context is good for selected categories and 28% thinks internationally developed products are also applicable locally, 10% of them thinks internationally developed products not catering the Sri Lankan requirement and need a customer oriented PD system.

In their practice, 58% of them using mixed system in their industries. 28% using the traditional top down approach and 8% using the new bottom up approach. 6% with both approaches in their industry.



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One important part of the study is to identify the critical barriers to introduce CDPD in Sri Lanka. Risk and production cost will be the most critical factor. Capital investment, time consuming and complex processes also became as critical factors. Creativity/ knowledge, global information, price income level, technology, quality, resources, and idea insurance becomes of average importance while internet usage, government restrictions and cultural issues appear to be the least barriers.

16% of all not sure about developing/redesign new products, especially for Sri Lankan culture, while 6% say not and 78% of them have an idea that it is possible to develop new products or redesign products for local cultural needs.

Selected best communication methods to reach the community rated as, TV, Internet and web, school and universities, newspapers, mobile apps, organizations and institutes, firms and companies. Internet and web is the most efficient way other than using mobile apps.

Final two questions are also important for implementation stages. It identified lack of proper guidance or teaching and lack of proper foundations to manage became as major barriers to introduce web based approach in Sri Lankan community. Trust also remains an average factor and Lack of engineering and design knowledge; lack of internet usage and lack of communication seem to have a minor effect.

Finally, developing traditional concepts in to modern requirements and engaging in global virtual communities for product development were selected as best implementing methods.

#### **4.2 Discussion in brief**

By going through the analysis, it was first identified that there is a big issue in awareness. All the respondents are engaged in some sort of interior design related project and have an overall experiences on such a project, within their areas of expertise. Most of them are updated with new concepts, technology, materials, market and prices etc. The industry in Sri Lanka still remains more familiar with top down management systems. Majority (58%) of the respondents still use external knowledge sources in to their ongoing interior-design related projects directly or indirectly. It proves that this approach to product design is not new in the Sri Lankan context. They are already familiar with the process but in different ways relevant to their ongoing projects in the industry. Such data proves that Sri Lankan professionals already know the NPD, and that they already experiencing it direct or indirect ways in their industry. There is, therefore, an opportunity for them to look for new approaches to implement specially for Sri Lankan furniture design industry. There should be a proper way to fill this gap.

Another problem was that the professionals are less familiar with new terms and trends in PD. Most of them are familiar with the internet and product development. However, working on virtual communities they have little experience on working on virtual collaboration platforms. This raises an issue of proper awareness and knowledge of global trends. Another identified issue was that although most of them

heard about PD web sites through a friend, only a few people had engaged in and were acquainted with them. As common in spreading news of new technology and trends among professionals, the positive word of mouth can actually not contribute much to the spread of community driven project development as most of the respondents do not know the benefits of it.

When working with companies, people critically consider trust, time consumption and risk on investment. People always products from a reputed company. Time consumption is directly related to the benefit of the outcome. The return on their time investment should be higher for already employed people to consider another opportunity for professional contribution. Risk on investment is also interconnected with the trust of the company. Firms need to check the ways in which they can build the trust. Also important is that there should be an awareness campaign to communicate the benefits and return on time and money invested.

More attention is need on the collaboration of experts such as architects and quantity surveyors because the areas of expertise of various professionals are different to one another. Designers, for example, are more aesthetic and focus more on concepts, design, and branding. Engineers focus more on design and production. Integrating the skills is necessary to fulfil the gap areas of each other. Therefore, there is a need for all industry experts to work together at branding, testing and pricing stages. The NPD is different and Customer decides the prices, as opposed to the earlier system of supplier deciding the price. Therefore, everyone can support on price decisions.

When considering the web based approach in NPD, there is a critical problem on awareness and trust of people. Idea coping is the most common. Patent or Industrial design registrations covers most of the property rights. Locally, it is not difficult to take a patent but internationally it is too costly. In addition, copyright systems can protect some areas of designs. Awareness is very important for web based CDPD too.

Formal education and government regulation seem not flexible enough to accommodate CDPD. Although government processes are slow and reluctant to change, some opportunity for integrate to integrate with the systems will be helpful for the development of the sector.

Also noted was the reluctance of the Sri Lankan people to work as volunteers. However, the virtual environments are always open for public. Everyone can engage in them on part-time basis without disturbing their everyday routine much. Return on investment is more important. Findings show that if it does not consider the time value of professionals, then it CDPD is bound to fail in Sri Lanka.

When developing a framework for Sri Lankan furniture design industry, it is necessary to consider the barriers specially. Risk, production cost, capital, time and complexity are the critical barriers that exist. Lack of capital means lack of resources and new technology. Time means time on investment. Complexity means the cultural gap between the parties involved. Government barriers to contribute negatively in online work environments, especially in terms of financial exchanges and fund transfers etc. However, the most critical factors need to be addressed first when developing framework for Sri Lanka.

Furniture industry is very familiar to the people but the familiarity with designed furniture seem quite far away. Still people are content going the traditional way of buying regular items and simple folded plastic furniture. If not they choose the local carpenter's shop to place an order, they would go to some mass-scale companies to buy low-cost products imported from overseas. The Sri Lankan society need a big awareness campaign with advertising and some other propaganda machinery to educate the public about the benefits of using designed furniture. Best communication method for awareness campaigns in Sri Lanka is the television. Internet or university and school also have a good potential of building awareness in the society. However, internet is the only best way to update everyone in the world in a second. There is an opportunity for using a mobile app as a gathering platform. Building awareness and knowledge and a trustworthy planned management system is

needed to implement NPD and web based CDPD in the Sri Lankan furniture design industry. The present research suggests two potential way-forward strategies in this regard. They are to develop and adopt traditional concepts to match modern requirements and to engage in global virtual communities for product development selected as best implementing methods.

#### **4.3 Framework for implementing community driven product development**

Using the identified critical and minor facts on developing customer driven strategy for furniture industry, a suitable framework can be developed to meet the requirements of the Sri Lankan industry. Some of the requirements were identified by literature and expert opinion reviews and critical factors were proven by the analysis. All those outcomes leads to make a better combination of interconnected framework.

In terms of the facts identified, two ways of implementation can be recommended. First, developing and adopting traditional concepts to meet modern requirement in an innovative way or second, increased engagements in relevant international virtual communities. It was identified, under the critical limitations and barriers for implantation of CDPD in Sri Lanka, that majority of Sri Lankan people are more concerned about trust and benefit. In order to fill the current gap in assuring trust and benefits, there should be a properly managed firm as the contact point for the professionals and skilled persons to use as a platform. It is always better if it is a reputed company with a solid capital investment or a high reputation. That would provide a launching pad for people and professionals to start engaging in CDPD. Such a firm should communicate regularly with the community. The identified critical factors like protecting ideas, risk identification, motivations, benefits and quality of the products need to be managed in an organized and professional manner by the firm. Increased knowledge on intellectual property, patent, industrial design registration can lead to make people more familiar with the system. In addition, the option to work part-time and flexible times should be there to raise and the motivation of the contributors. Further, a secure environment and fast and trouble-

free internet is a must, as boring and dull environments keep people away and less creative. As the research findings suggest, in Sri Lanka, it cannot be successful without motivation. Starting from the web, some motivational features should be put in place to attract people to the process.

Knowledge sharing on the internet is not that much critical in practice. All those platforms are already functioning in European culture. Only Sri Lankan potential contributors need to know about the systems and learn the beneficial way using their time in proper management. Everyone can work on those on part-time basis or during whatever leisure time they have. Benefits depend on the time they consume and effort they put in. In International CDPD frameworks, most problematic stages for Sri Lankan were identified as, idea copying, less benefit, time consumption, and lack of quick income and need to pay for registration in some instances. Most of such expenses can be recovered through the web-based platforms by contributing to work. However, that initial payment is a gap for many potential contributors. Further, quick incomes are not available other than on everyday working job. They cannot predict quick income with international web-based platforms. Those have a period to developments to implementation. If there is a way of starting a virtual environment especially for Sri Lanka then it can raise some of those requirements through a locally interconnected way.

Awareness building on CDPD is a must in the Sri Lankan culture. There should be some better outreach methods to Sri Lankan society and build awareness and trust about CDPD and its impact on furniture design and manufacturing industry while highlighting the benefits. Selected media and educational activities and workshops can be organised to meet this requirement. Concurrently, brand promotion and advertising can also back up the awareness building project. All those can be illustrated in a graphical framework as below.

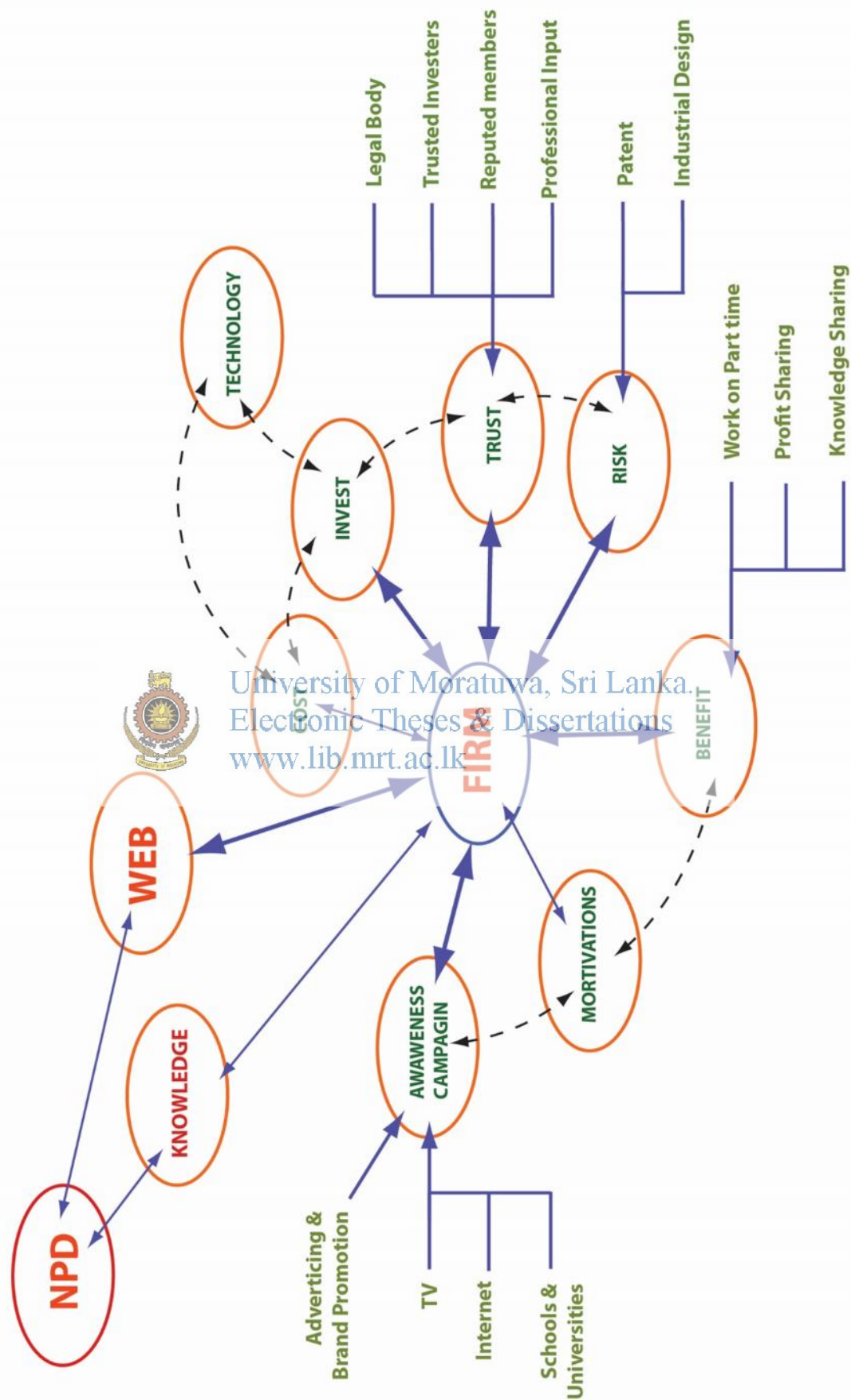


Figure 4.1: Frame for implementation



#### **4.4 Opportunities available for implementation**

There are lots of reputed furniture companies and professionals. Consumers in Sri Lanka still trust a product that comes under a reputed organisational or personal brand name, and with a warranty. These methods can be implemented on existing furniture companies with a well-defined team of management and working. Normally, this is a high cost affair requiring high investment at the start. Therefore, a good investor is most essential. People engage in CDPD for benefits. Maybe the professionals won't contribute in something if they do not get any benefit or cash. The drawback of the existing virtual community approach is its lack of guarantee of direct benefits. Firms pay for the contribution at different stages of the total process. These concepts also can be applied to a framework development for local furniture industry.

Already some Professionals use the new approach to product development. It is possible that they contribute more, on part-time or voluntary or for financial remuneration if they get more benefit than they have at the moment. The establishment of a secured management body with different specialists is the best solution that Sri Lankan furniture industry can have for CPDP development.

#### **4.5 Limitations**

- The selected professionals do not represent the total society, as the sample comprised of the best-educated category of the country. Therefore, their ideas are important and practical but does not reflect the opinion of the general public. However, general public's awareness on the subject may be very low. It is a limitation that this research does not study the opinion of the general public.
- Owing to the choice of the respondents, this research misses out on opinion and feedback on small scale carpentry practiced around the country.
- When a firm becomes an organizing body, they need to build a large team of designers, engineers, production and martial specialists, a well-trained marketing team, legal staff and a reliable customer base that can uphold the reputation of the



business. Only a few businesses have been able to maintain that reputation and some of them use the mixed method of NPD with traditional top-down method.

- Forming a new business entity in the furniture industry cannot survive without proper suppliers and manufacturing partners. There should be a good connection between design and manufacturing sectors.
- Every media is not applicable for design and development activities. Internet is the best and the most practical method to gather people into one platform with real time updates.
- Most people are everyday workers. It is not a practical idea to engage them in to a new process that does not have a strong base or enough public awareness. As such, CPDP could complement potential contributors' general lifestyle without harming their everyday activities.
- Any newly established firm must have rules and regulations, limitations and terms to protect the workers from cheaters and people who would harm the brand identity.



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#### **4.6 Contribution to industry and society**

The best advantage of CDPD is that it allows consumers to design the furniture for their needs. The client can engage in each step of the production process and make sure it confirms with the requirement. Because the client knows their requirement more than the firms do, integrating customer knowledge and experiences may very important for the company's side. Companies can identify the customer requirement and negative feedback also. Those will lead them to guide newly improved furniture products than traditional and typical products that mainly focused on economic aspects.

However, few industries benefit from NPD. In the furniture industry, the use of NPD is still in its primary stage. Therefore, there exists a good opportunity for people to gather and share their knowledge with colleagues and contribute to the development

process at the same time. The contributors should have the freedom to work as they wish with web-based platforms. Professionals prefer to use their free time or work part-time in NPD activities. Industries have the opportunity to collect diverse experts' knowledge into their design and production process while keeping a necessary distance, as outsiders do not engage with the company directly.

Contributing NPD on Sri Lankan furniture industry brings benefits to Architecture/interior design related activities while bringing about personal benefits to every participant in the process.

#### **4.7 Further research**

- There is an opportunity to find the opinion and reactions of Sri Lankan public about NPD. Further, implementation of CDPD in Sri Lankan context can be studied.
- An opportunity exists to research into the implementation of CDPD for other product design and in industries other than furniture.
- A study on the availability of local companies to launch or organize a web-based environment for Sri Lankan people.
- There is a need of identify why those new concepts are still less familiar with Sri Lankan educational systems.

The reason why majority of Sri Lankan people are still reluctant to use the opportunities in Social networks and virtual communities as a beneficial method other than fun activity.

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## Questioner on Community Driven Product Development Approach

A research to identify the new product development approach and barriers to spread consumer driven product development in Sri Lankan society. (Developing products through consumer support and ideas). Data collect from Graduated professionals after 2007 of all field categories from University of Moratuwa.

### 1. What is your profession?

|                   |                      |          |                      |           |                      |
|-------------------|----------------------|----------|----------------------|-----------|----------------------|
| Engineer          | <input type="text"/> | Designer | <input type="text"/> | Architect | <input type="text"/> |
| Quantity Surveyor | <input type="text"/> |          |                      |           |                      |

### 2. Are you engage with development projects taking peoples' knowledge outside the company?

|     |                      |    |                      |
|-----|----------------------|----|----------------------|
| Yes | <input type="text"/> | No | <input type="text"/> |
|-----|----------------------|----|----------------------|

### 3. How often you using internet?

|       |                      |                   |                      |        |                      |
|-------|----------------------|-------------------|----------------------|--------|----------------------|
| Daily | <input type="text"/> | 2- 3 Times a week | <input type="text"/> | Rarely | <input type="text"/> |
|-------|----------------------|-------------------|----------------------|--------|----------------------|

### 4. Are you familiar with any of those words?

|                                      |                      |                   |                      |
|--------------------------------------|----------------------|-------------------|----------------------|
| Product development                  | <input type="text"/> | All the above     | <input type="text"/> |
| Community driven product development |                      | None of the above | <input type="text"/> |
| Social product development           |                      |                   |                      |
| Virtual communities                  |                      |                   |                      |

### 5. How much you Familiar with those web sites functions compared to each other?

|                     | Never | Sometimes | Often | Always | Extremely |
|---------------------|-------|-----------|-------|--------|-----------|
| Goods purchasing    |       |           |       |        |           |
| Social web sites    |       |           |       |        |           |
| Internet Blogs      |       |           |       |        |           |
| Product Development |       |           |       |        |           |
| Freelancing         |       |           |       |        |           |

### 6. What are the web sites you know from following?

|                               |                      |
|-------------------------------|----------------------|
| www.edisonnation.com          | <input type="text"/> |
| www.quirky.com                | <input type="text"/> |
| www.kickstarter.com           | <input type="text"/> |
| www.inventwithnokia.nokia.com | <input type="text"/> |
| www.yankodesign.com           | <input type="text"/> |
| www.windowphone.uservice.com  | <input type="text"/> |

7. Any other customer oriented product development web sites or firms you know than the above?

.....

.....

8. How you heard about those web sites for the first time?

|      |                      |                               |                      |            |                      |
|------|----------------------|-------------------------------|----------------------|------------|----------------------|
| Here | <input type="text"/> | Friend                        | <input type="text"/> | Web search | <input type="text"/> |
| News | <input type="text"/> | Introduced by an Organization |                      |            |                      |

9. Are you a member of any community that developing products by consumer feedbacks? Then what is it?

.....

.....

10. Did you submit ideas, support or invest on any of those projects

|     |                      |    |                      |
|-----|----------------------|----|----------------------|
| Yes | <input type="text"/> | No | <input type="text"/> |
|-----|----------------------|----|----------------------|

11. If you work with them to develop consumer products, what is your target?

|                   |                      |
|-------------------|----------------------|
| Good product      | <input type="text"/> |
| Earn Benefit      | <input type="text"/> |
| Voluntary Support | <input type="text"/> |
| Just for fun      | <input type="text"/> |
| Self-Satisfaction | <input type="text"/> |

12. Are you looking for quick benefits only?

|     |                      |    |                      |
|-----|----------------------|----|----------------------|
| Yes | <input type="text"/> | No | <input type="text"/> |
|-----|----------------------|----|----------------------|

13. Please put if you know any product development firms using people ideas and comments for their product design and development in Sri Lanka

.....

.....

14. Do you interested to give your ideas for companies' product development process?

|     |                      |    |                      |         |                      |
|-----|----------------------|----|----------------------|---------|----------------------|
| Yes | <input type="text"/> | No | <input type="text"/> | Depends | <input type="text"/> |
|-----|----------------------|----|----------------------|---------|----------------------|

**15. Why you are backward to give your invention ideas for companies' product development?**

|                      | 1 Min | 2 | 3 | 4 | 5 Max |
|----------------------|-------|---|---|---|-------|
| Trust                |       |   |   |   |       |
| Benefit              |       |   |   |   |       |
| Time                 |       |   |   |   |       |
| Return on investment |       |   |   |   |       |
| Risk                 |       |   |   |   |       |
| No Chance            |       |   |   |   |       |

**16. What are most suitable stages you can engage on product development?**

|            | Non | Slightly | Generally | Completely |
|------------|-----|----------|-----------|------------|
| Concept    |     |          |           |            |
| Research   |     |          |           |            |
| Design     |     |          |           |            |
| Production |     |          |           |            |
| Branding   |     |          |           |            |
| Testing    |     |          |           |            |
| Pricing    |     |          |           |            |

**17. What are the major reasons that Sri Lankans not involving on design development by people through internet?**

|                                | No 1 | 2 | 3 | 4 | Yes 5 |
|--------------------------------|------|---|---|---|-------|
| Communicated about systems     |      |   |   |   |       |
| Quick income                   |      |   |   |   |       |
| time                           |      |   |   |   |       |
| Benefit on spending time       |      |   |   |   |       |
| Complex                        |      |   |   |   |       |
| Trust on companies             |      |   |   |   |       |
| Some web sites need to pay     |      |   |   |   |       |
| Trust on people (idea copying) |      |   |   |   |       |
| Intellectual property rights   |      |   |   |   |       |
| Ideas exists                   |      |   |   |   |       |
| Interest on design             |      |   |   |   |       |
| Knowledge                      |      |   |   |   |       |

**18. What are the risks you face?**

|                    | Never | Minor | Medium | Very | Extremely |
|--------------------|-------|-------|--------|------|-----------|
| Less benefit       |       |       |        |      |           |
| Busy, No time      |       |       |        |      |           |
| Ideas going public |       |       |        |      |           |
| Idea Cheaters      |       |       |        |      |           |
| No knowledge       |       |       |        |      |           |
| No interest        |       |       |        |      |           |

**19. Do you think globally developed products did not cater Sri Lankan requirement and need a customer oriented product development system?**

Yes  No  Only for selected categories

**20. What is the major approach in your company at the moment?**

Bottom- Up  Top- Down   
Mixed  Both

**21. Rate those barriers to spread community gathered product development in Sri Lanka?**

|                         | Low 1 | 2 | 3 | 4 | High 5 |
|-------------------------|-------|---|---|---|--------|
| Internet use            |       |   |   |   |        |
| Creativity/ Knowledge   |       |   |   |   |        |
| Time consuming          |       |   |   |   |        |
| Global Information      |       |   |   |   |        |
| Capital Investment      |       |   |   |   |        |
| Price income level      |       |   |   |   |        |
| Production cost         |       |   |   |   |        |
| Technology              |       |   |   |   |        |
| Complex process         |       |   |   |   |        |
| Resources               |       |   |   |   |        |
| Quality                 |       |   |   |   |        |
| Risk                    |       |   |   |   |        |
| Idea insurance          |       |   |   |   |        |
| Cultural issues         |       |   |   |   |        |
| Government Restrictions |       |   |   |   |        |

**23. Do you think we can develop/ redesign products especially for Sri Lankan culture?**

Yes  No  Not Sure

**24. What do you think the best communication method to take it in to Sri Lankan society?**

|                              | Bad | Acceptable | Better | Good | Best |
|------------------------------|-----|------------|--------|------|------|
| TV                           |     |            |        |      |      |
| Internet and web             |     |            |        |      |      |
| News papers                  |     |            |        |      |      |
| Mobile apps                  |     |            |        |      |      |
| Firms and companies          |     |            |        |      |      |
| Organizations and Institutes |     |            |        |      |      |
| Schools and Universities     |     |            |        |      |      |

**26. What you think the barriers to Introduce web based communities in Sri Lanka?**

|                                          | Bad | Acceptable | Better | Good | Best |
|------------------------------------------|-----|------------|--------|------|------|
| Lack of Communication                    |     |            |        |      |      |
| Lack of Internet and web usage           |     |            |        |      |      |
| Lack of design and engineering Knowledge |     |            |        |      |      |
| No trust                                 |     |            |        |      |      |
| No proper guidance & Teaching            |     |            |        |      |      |
| No proper foundation to manage           |     |            |        |      |      |

**27. What are the available ways to develop ideas in Sri Lanka?**

Developing traditional concept in to modern requirement  
 Substitute concepts develop for Sri Lankan context  
 Develop products under those limitations  
 Engage people in to existing firms' product development process  
 Engage with international global communities for product development  
 Organize virtual communities for Sri Lankan requirements

## Appendix - 2

**Identify the new Product Development Approach and barriers to spread customer driven product development in Sri Lankan society.**

### 1 Why you are backward to give your invention ideas for company's product development?

|                      |                      |   |
|----------------------|----------------------|---|
| Trust                | <input type="text"/> | % |
| Benefit              | <input type="text"/> | % |
| Time                 | <input type="text"/> | % |
| Return on investment | <input type="text"/> | % |
| Risk                 | <input type="text"/> | % |
| No chances           | <input type="text"/> | % |
| Other :              | <input type="text"/> |   |

### 2 What are most suitable stages you can engage on product development?

|            |                      |   |
|------------|----------------------|---|
| Concept    | <input type="text"/> | % |
| Research   | <input type="text"/> | % |
| Design     | <input type="text"/> | % |
| Production | <input type="text"/> | % |
| Branding   | <input type="text"/> | % |
| Testing    | <input type="text"/> | % |
| Pricing    | <input type="text"/> | % |
| Other :    | <input type="text"/> |   |

### 3 What are the major reasons that Sri Lankans not involving on design development by people through internet?

|                                  |                      |   |
|----------------------------------|----------------------|---|
| Communicated about those systems | <input type="text"/> | % |
| Quick income                     | <input type="text"/> | % |
| Time                             | <input type="text"/> | % |
| Benefit on spending time         | <input type="text"/> | % |
| Complex                          | <input type="text"/> | % |
| Trust on companies               | <input type="text"/> | % |
| Some web sites need to pay       | <input type="text"/> | % |
| Trust on people (idea copying)   | <input type="text"/> | % |



|                              |                      |   |
|------------------------------|----------------------|---|
| Intellectual property rights | <input type="text"/> | % |
| Ideas exists                 | <input type="text"/> | % |
| Interest on design           | <input type="text"/> | % |
| Knowledge                    | <input type="text"/> | % |
| Other :                      |                      |   |

**4 Rate those barriers to spread community gathered product development in Sri Lanka?**

|                         |                      |   |
|-------------------------|----------------------|---|
| Internet use            | <input type="text"/> | % |
| Creativity/ Knowledge   | <input type="text"/> | % |
| Time consuming          | <input type="text"/> | % |
| Global Information      | <input type="text"/> | % |
| Capital investment      | <input type="text"/> | % |
| Price income level      | <input type="text"/> | % |
| Production cost         | <input type="text"/> | % |
| Technology              | <input type="text"/> | % |
| Complex process         | <input type="text"/> | % |
| Resources               | <input type="text"/> | % |
| Quality                 | <input type="text"/> | % |
| Risk                    | <input type="text"/> | % |
| Idea Insurance          | <input type="text"/> | % |
| Cultural issues         | <input type="text"/> | % |
| Government restrictions | <input type="text"/> | % |
| Other :                 |                      |   |



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**5 What do you think the best products suitable for Sri Lankan Culture?**

|                               |                      |   |
|-------------------------------|----------------------|---|
| Automobile                    | <input type="text"/> | % |
| Electronics & Power           | <input type="text"/> | % |
| Health & Fitness              | <input type="text"/> | % |
| Home & Garden                 | <input type="text"/> | % |
| Kitchen accessories           | <input type="text"/> | % |
| Parenting & Kids              | <input type="text"/> | % |
| Play                          | <input type="text"/> | % |
| Travel & Adventure            | <input type="text"/> | % |
| Office supplies               | <input type="text"/> | % |
| Furniture & Consumer products | <input type="text"/> | % |
| Software & IT                 | <input type="text"/> | % |
| Other :                       |                      |   |

**6 What you think the barriers to Introduce web based communities in Sri Lanka?**

|                                          |                      |   |
|------------------------------------------|----------------------|---|
| Lack of Communication                    | <input type="text"/> | % |
| Lack of Internet and web usage           | <input type="text"/> | % |
| Lack of design and engineering knowledge | <input type="text"/> | % |
| No trust                                 | <input type="text"/> | % |
| No proper guidance and teaching          | <input type="text"/> | % |
| No proper foundation to manage           | <input type="text"/> | % |
| Other :                                  |                      |   |

**7 What are the available ways to develop ideas in Sri Lanka ?**

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