JOURNEY OF JERRycAN
Sustainable Local Product Design Development for SMEs Designers
: A case study from Kampala, Uganda
Abstract

Keywords / Sustainable Development, Sustainable Product Design, Local design, SMEs (Small, Medium sized Enterprises), Cultural value, PSS (Product Service System)
In this sustainable era, the main questions and aims of the work of designers and non-designers should focus on how products must be designed or redesigned to promote sustainable development. This thesis research is a holistic process of product design development, especially aiming at active local designing. The key point of this Sustainable Local Product Design (SLPD) is to objectify local cultural values and integrate them as a part of the whole design process as much as the designer (and non-designer) can accept, or is capable of doing. This is in order to examine how Design for Sustainability (DFS) processes can change and become customized according to local conditions, and also reveals what designers can do for the local and what can be taken from the local. The major aim is thus to pursue potential local sustainability in given local conditions. In SLPD, the crucial core of the whole research is to maintain and extend the lifecycle of the products, which could be designed with cultural and, social values.

The project’s process aims at merging the local culture into physical, locally designed-products as designers actively learn from local community members. The structure of this master’s thesis consists of three main parts which are a research, field research and sustainable design strategy. The target area of the field research, named by Beam project, was Uganda, East Africa. In the process, jerrycan, which is a plastic water canister, was the main material for SLPD and a symbol of local water problems. At the same time, all designed products from jerrycan are strongly related to social issues, such as water issues, education and transportation.

In the end, SMEs (Small and Medium-size Enterprises) suggest, applying the design to a simplified product service system by connecting real stakeholders and then evaluating the design and the system based on a simply optimized assessment tool for the design process as a sustainable design strategy.
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1.1 Background of the research

Time to change through the design
As pointed out by McDonough, if the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years (McDonough 2009). The crisis of unlimited current patterns of consumption and production has already caused serious, permanent global changes until now. We realize today that we need to change our current unbalanced consumption behavior. The sustainable development of human society has been based on the idea of development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland 1987). The world has started to rethink, how our course from the current path of development towards the sustainable ways of creating global wealth should be changed.
According to Manzini, industrial production, at least in its most advanced areas, can no longer be taken back to the simplified vision of enterprises that produced material products for undefined, non-localized consumers. He continues, saying that today industrial production tends to define itself as the realization of complex, interacting systems that emerge from the convergence of numerous and differently motivated actors (Manzini 2004). Thereby, in the era of sustainable design, it is design’s ability to operate through ‘things’ and ‘systems’ that makes it particularly suitable for dealing with contemporary societal, economic and environmental issues (Fuad-Luke 2009).

Sustainable product design is a design philosophy and practice in which products contribute to social and economic well-being, have negligible impacts on the environment and can be produced from a sustainable resource base. In order to realize a major shift away from the current mass consumption and production behaviors and systems, DFS strongly needs creative innovation. Sustainable innovation and design are not necessarily about new technologies, but about rethinking how to meet the need for growth while at the same time reducing negative environmental and social impacts (Clark 2009). Moreover, the diverse range of approaches for sustainable design concepts requires designers with different roles.

Current Challenges
Although we could think that Sustainable Product Design (SPD) is the best way to change our unsustainable consumption and production, it also has some limitations. Designing for sustainability, including eco designs, has been developed as a globalized concept, which is administered only from the macro level, not the micro level of the actual design practices. Since the 1980’s, the industrial sector has shown signs of working more and more conscientiously in the direction of sustainable development across the globe (Carolien 2001), but the problem is that the existing industry regulations focus on larger industries, as do consumer organizations and environmental agencies (De Bruijn 1994). Starting from the 1970’s, much effort towards sustainable development has
been processed and developed worldwide, but mostly at the macro level (e.g. global companies, NGOs, university, governmental regulations and policies, global standards for eco-design, accurate assessments).

Moreover the concept of eco-design is clear for evaluating the design work based on their environmental efficiency and effectiveness, but in the case of the SPD concept, is still purely developed based on three pillars (i.e. people, profit, planet) of ethical consumption and production. These criteria are hard to apply into design processes and especially into micro actions, because of broad and subjective themes that are used to evaluate the process, such as social values and moral issues.

As a result, monocultures of sustainable design approach focusing on the macro side tend to become inherently vulnerable and unstable. In order to achieve the ultimate goal of sustainable development, we must engage with diverse local, micro approaches and practices, and understand them as important macro level actors. Hence, strengthening sustainable production practices must be a bidirectional process, where macro and micro levels must integrate and merge to serve the common target of sustainable development.

1.2 The aims of research

Micro approach

The focus of this research is on the micro level actions and practices. Conclusively, this master’s thesis study strives to promote micro-organisms of sustainable development as equally as important as the macro level actions. Thus, local fieldwork and practices should gain more attention from designers working for the progress of sustainable development.

Currently, the biggest challenge for the success of sustainable development is that the development has to be simultaneously balanced at the macro and micro levels to reach equilibrium. Balanced sustainable development, in turn, requires diverse innovative micro approaches that are aimed at cultural, social, economic and environmental improvements at the local level. These micro
actions should be planned and implemented. In this research, it is suggested that designers from SMEs (Small and Medium sized Enterprises) work at the local, grass roots level of communities, using local materials, resources and empowering the local skills of people as part of the design process. Designers working at the local level are able to evaluate the true needs of local communities and society. Further, the designers can empower local community, people and improve their skills as part of the design process. Also, this research and field research point out that we cannot understand deeply the character of materials and their message if we do not go into the field, find the material from the nearby market and create the design outcomes together with small sized local manufacturers.

As a result, this research aims at giving examples of how small and medium sized enterprises (SMEs)¹ such as small independent design studios could activate the sustainable product development of a local community and the society at large. Innovative SMEs can play a much bigger role especially in developing national economies, alleviating poverty, participating in the global economy and partnering with larger corporations (WBCSD 2007).

Truly understand local culture
Small-sized independent designers face big challenges in reality mostly due to two reasons; firstly, they lack practical information of local contexts, which means that the independent (product) designers have to collect all information they need to design their own ways through the actual fieldwork. Secondly, the gap is caused by the generalized global manufacturing systems, which are able to produce high quality products is mass amounts. For independent designers, this means that they must try to catch up with the quality of globalized, large-scale manufactured products. However, it is extremely hard to reduce the quality gap with local resources that small-scale independent designers use.

¹ Independent small scale designer : In general, SMEs means business size under 250 people from the definition of world bank. http://www.worldbank.org/ There is no universally agreed definition of SMEs. Some analyses define them in terms of their total revenue, while others use the number of employees as an indicator. In the EU economy, roughly 93% of SMEs are microenterprises (see http://www.unece.org/indust/sme/sme-role.htm). In this research, SMEs, MSEs, MSMEs are the same meaning.
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This is the major reason, why independent product designers need to explore and find different approaches and strategies to survive in the battle with global manufacturing systems. This research in this thesis is also aimed at discussing not only in what independent product designers (e.g. SMEs, non-design entrepreneurs) should do at the micro level to truly understand local culture, but also how they can design local products in sustainable ways (e.g. material use, product service) with local, meaningful contents and values.

1.3 Research data and methodology

Research
In this research, the meaning of sustainable local product design must acknowledge the lack of resources, knowledge etc. in the local context chosen for the design process. From this acknowledgement, creative ideas for the local product designs actually emerge. The lack, however, cannot be recognized and processed without gaining a diverse understanding about the local culture and local conditions. In the end, all particles of the local design process should be connected with a holistic view that systemically conserves the products into a long-term product cycle. After this, the design outputs are developed with sustainable strategies such as a simplified feedback method for the Sustainable Local Product Design (SLPD) and local brand.

Until today, various local product projects have already been processed to improve the quality of local lives at both the macro and micro levels. For instance, industrial approaches such as ‘design for the other 90%’, recycling concept products and, craft-driven concepts are all examples of local product design. These designs for local improvement are based on the three primary concepts of sustainable design, social equality, dematerializing and large- and small-scale social impacts. In this master’s thesis, the approach to sustainable local products and the suggested alternative ways are based on the previous local product design models.
Field research
The approach of this research has its origins in the field research, which was completed in Kampala, the capital of Uganda. The field research and the findings function as a case study of SLPD (sustainable local product design) by seeking to define the sustainable local products design and developing alternatives for the target local area. The case study that took place in Kampala examines the local culture, social issues and local manufacturing systems and skills, which could be found only by experiencing local conditions. Accordingly, the target products were designed from the viewpoint of a product designer by implementing local knowledge into the design process. Connecting with local people and understanding of the local contents and values helped to fulfill the identified local needs.

Sustainable local design strategy
In order to design sustainable products, proper strategies for sustainability are necessary to extend the lifecycle of the products. From the viewpoint of this research, one of the solutions to develop sustainable products is the holistic system approach. Accordingly, this study applies the pragmatic Product Service System (PSS) to design and extend the target products of the field research to a map, which makes the connection between the stakeholders and parts of the design outcome explicit. As a suggested strategy for SLPD, the simplified feedback method can help to improve the quality of the product and process tool. However, it is important to take into account that the aim of this research is not to develop the simplified SLPD assessment tool as such, but to give an example about how to measure the outcomes of micro level practices and sustainable local product design. Hence, a detailed analysis of the created SLPD tool is left out of this research and is only contemplated as a supportive measurement for the outcomes from the field research.
1.4 Structure of this thesis

This research consists of three parts, literature research, field research and design strategy (See Figure 1-1). After introducing the topic and motives of this research for the reader (chapter 1), chapter 2 analyzes the concept of sustainable design based on previous research. In chapter 3 the most essential part of this research, sustainable local products and their characteristics, are
defined. Chapter 4 focuses on describing the methodology of this research—the case study of local product design in Uganda. In chapter 5, development of a case-design process is introduced, as well as the identified needs to which the design process was customized. In chapter 6, the example solutions and strategies for sustainability are described. The most important section of this research is to apply the theory of SLPD (chapters 3 and 6) to real conditions, in which the sustainable local product design process takes place (chapters 4, 5 and 6). Throughout the research, each chapter aims at strengthening and constructing the core theme of SLPD, which is the learning by doing approach.
2. PRODUCT APPROACHES PAST AND PRESENT

Major issues of today’s products
Definition of a sustainable product
The role of designer in the sustainable era
Limitations of global strategies

2.1 Major issues of today’s products

2.1.1 Cold-hearted products

According to Maslow and Lowery, quality of life embodies the satisfaction of material and non-material human needs and the fulfillment of human desires and aspirations, which can be met through a variety of alternative material and non-material satisfiers (Maslow 1998). Throughout the history of mankind, human beings have been consuming material and immaterial goods in order to reach an ever-receding satisfaction threshold. In fact, the balance between humans and nature in terms of producing and consuming material and resources to improve quality of life was broken after the industrial revolution started from the middle of the 19th century\(^1\). Despite the first spread of the art

\(^1\) The term ‘Industrial Revolution’ as applied to technological change was becoming more common already by the late 1830s, as in Jérôme-Adolphe Blanqui’s description in 1837 of la révolution industrielle. /Hudson, Pat (1992). London: Edward Arnold. p. 11. ISBN 978-0-7131-6531-9.
and craft movement by Ruskin and Morris in the early 20th century to improve the poor conditions caused by industrialization, designed-products have been produced and consumed at an increasing speed to fulfill the insatiable human desires of today. McDonough aptly notes that the design intention behind the current industrial infrastructure is to make an attractive product that is affordable, meets regulations, performs well enough, and lasts long enough to meet market expectations (McDonough 2002). Such a product fulfills the manufacturer’s desires and the customers’ expectations. However, from their perspective, products that are not designed particularly for human and ecological health are unintelligent and inelegant. Ironically, designed products that claim to improve the quality of a customer’s life are actually designed based on commercial and business purposes of current market rule, not based on the human need of individuals consuming the designed-products.

By the early 20th century, when the design was ruled by the agenda of Form Follows Function, the products had a strong reason to be produced. Functionalists, such as Ludwig Mies van der Rohe, Walter Gropius and Le Corbusier, had goals for standardization in order to replace unsanitary and inequitable housing conditions of the poor. Their designs started from social inequality, not from the liberal trade principle. Even though the forms of the first design era seemed to be boring and conservative, there were strong desires for improving the quality of life for human beings. However, as the history of design went by, designers started to put far too much effort into aesthetic and stylistic aspects of design rather than considering the whole product (Papanek 1971). Walker confirms this idea by noting that the product designer’s area of concern was restricted to the object itself (Walker 2010). To satisfy customers’ needs within liberal market capitalism, the market driven products created by anonymous, less-responsible designers thus gained ground and became the mainstream of production today.

In contrast with the first intention of the international style movement

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2. The American architect Louis Sullivan wrote “Form ever follows function. This is the law.” in his article “The Tall Office Building Artistically Considered” in 1896. And then this rule became a main principle of modern design.
(McDonough 2002), everyday products around us that are produced only to serve the economy are not only harming human life styles, but also burdening the carrying capacity of nature. That is, the accelerating processes of globalization and trade liberalization, supported by advances in information technologies, have fundamentally changed the landscape of the private sector in all countries -developed and developing- providing new opportunities and challenges (UNEP 2006). In brief, the world is realizing that we need big, permanent changes in our consuming habits. The change needed is not only physical (i.e. change of actual consuming behavior), but also mental (i.e. attitude to consume).

2.1.2 Global evolution of the sustainable development

McDonough and Braungart remark that if the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years (McDonugh 2002). That is, it is clear that current patterns of consumption and production are unsustainable (UNEP 2006). Figure 2-1 demonstrates the process of realization about the need for global sustainable development. The timeline takes into account important design issues that have promoted sustainable development between the 1970’s and 2010.

Since 1987, sustainable development has had a commonly-held target of reaching the stage of development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED 1987 Brundtland commission). As shown in the Figure 2-1, there are various global issues and conferences regarding sustainable development that have developed the concept further. After Brundtland’s commission, the efforts for the sustainable development have become a worldwide agenda that affect countries globally. From Figure 2-1, eco-design concepts were adopted starting in the 1990’s from globalized companies. In the field of product design, small design activities by independent design studios, semantic design3, (which

3. Semiotics is the study of meaning formation, signification and communication. (Design semiotics in Use 2010 Susann Vihma)
Figure 2-1. Timeline of sustainable development
studies the collective connections of human cognition, ecology and cultural meaning embedded within design) and, socially responsible design began to emerge.

Since the international agreements and additional efforts, such as world commissions, have influenced how people think about the relationship between humans and nature in different ways, such movements are important. We can think that the current definition of sustainable development is a counter reflection of the previous heedless consumption of natural resources. Simultaneously, it means that un-limited mass consumption does not guarantee the satisfaction and well-being of humankind, since we know it harms us when we do it (i.e. consume without limits). Even though Brundtland’s commission (1987) made many attempts to define sustainable development, the meaning of sustainable development is still multifold and ambiguous and hence difficult to understand. Further, sustainable development is not an independent concept with one approach and with one right answer, but it consists of a wide range of diverse factors that are connected in complicated ways. A systematic thinker, Gallopin suggests that a socio-ecological system is defined as any system composed of a societal (or human) component (subsystem) in interaction with an ecological (or biophysical) component (Gallopin 1989).

For this reason, planners and designers seeking sustainability should have more holistic views for sustainable development. It is not only concerning economic development, but, as pointed out by Gallopin, sustainable development should be designed to improve the quality of life and quantitative increase in wealth from material and non-material interaction. In addition, this development has to be approached based on the sustainability of the whole socio-ecological system, which is strongly linked to society and nature. Sustainable development requires integrating economic, social, cultural, political and ecological factors (UNCED 1992), while simultaneously taking into consideration the local and the global dimensions and the way they interact (Gallopin 2003).
2.1.3 Interest in sustainable design

Tischner said that sustainable development will become an increasingly prominent issue in this decade, when present patterns of development and consumption cannot be sustained in a world of growing population, rising human aspirations and limited carrying capacity. Accordingly, to move towards a more sustainable society there will need to be fundamental changes to avoid serious risks to human wellbeing and natural systems (Tischner 2001).

However, it is difficult to implement the ideas of sustainable development if they cannot be applied to the business world (James 1997). Even though sustainable development is crucially necessary to promise an ideal future for both, humans and nature, it may be hard to take the initial steps if there is no specific strategy to move from unsustainable toward sustainable development. Spangenberg sees that this issue limiting sustainability is economically attractive only if a sustainable mode of production is cheaper than a non-sustainable one. The situation is different in the case of quality competition faced by small and big companies striving for sustainable consumption (Spangenberg 1995).

Accordingly, Spangenberg suggests three main criteria to succeed in quality competition; **added value, customer demand** as well as **cost**. From this point of view, Clark mentioned product innovation as instrumental for economic growth (Clark 2009). In order to decouple unsustainable patterns of consumption and production, changes through the design of new, sustainable goods and services must be part of a more sustainable future. Businesses that want to become or remain competitive will need to address these issues to succeed (Clark 2009). After the experience of crude products (McDonough 2002) that were produced by market-driven strategies (Morelli 2004), from the brutal force of industrialized world power, design now will have an opportunity to power the change at the global scale. As noted by Clive, design can become once again a means of ordering the world rather than merely of shaping products (Clive 1982).

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2.2 Definition of a sustainable product

2.2.1 Eco-design

Since the 1990’s, many companies have engaged in the concept of eco-design, which refers to Design For Environment (DFE) which in turn focuses on efficient and effective resource use. Figure 2-2 exemplifies the differences and boundaries between eco-design and sustainable design. According to Lewis and Gertsakis, the task of an eco-designer is a DFE approach concerned with delivering meaningful environmental benefits, possible only through mainstreaming environmental concerns and realizing low-impact products that are culturally relevant, economically viable, technically innovative and ecologically compatible (Lewis and Gertsakis 2001). Further, they clarify that eco-design strategies can reduce environmental impacts and thus eco-design approaches should be implemented based on accurate environmental analysis (Lewis and Gertsakis 2001).

The accurate analysis, in turn, is the most important tool to evaluate the success of the outcomes of the design as far as eco-design is concerned. In such analysis, the factors with a negative impact on the environment are first ascertained and then their importance is determined on the basis of their effect on the more fundamental environmental criteria (Tishner 2001). This means that designers must prove through different assessment tools that the eco-design is “much better” than non-eco-design. In other words, eco-design and its outcomes are based on comparable evident lists, such as cradle to cradle certification and, LCA (Life Cycle Assessment) tools that will demonstrate how much the process is proven compared to non-eco-design products processes. Hence, we could say that eco-design is actually relatively mechanical and focuses on the outcomes and specific numbers of the design process. In this view, the accurate assessments tools such as LCAs, global standard ISO series and MIPS (Material Input Per unit of Service) are imperative factors of eco-design and aim at persuading customers by promising some concrete numeric and measurable information about a product’s sustainability. Due to the
worldwide effort to designate certain assessment tools to improve the eco-design process, DFE has developed relatively fast and several assessment tools have been created in a short period of time.

2.2.2 Definition of sustainable product design

According to Tischner, the choices made in materials, forms, colors and production systems also affect the use and disposal of the product in the whole life cycle, and the designer thereby also influences patterns of sustainable consumption. Decisions made during the product design and development process affect up to 80% of the environmental and social impacts of a product (Tischner 2001). Further, Brezet finds sustainable product design to be a design philosophy and practice, in which products contribute to social and economic well-being, have negligible impacts on the environment and can be produced
from sustainable resource base (Breset 1997). When it comes to DFS (Design For Sustainability), it is a unique methodology, since it does not only encompass all three pillars5 of sustainability (i.e. people, profit, and planet), but also it is applicable to supporting sustainable production capacity in developing countries (Clark 2009). Therefore, in order to shift current mass consumption and production behaviors and systems, DFS strongly needs creative innovation. It is important to notice that sustainable innovation and design are not necessarily about new technologies, but about rethinking how to meet the need for growth while at the same time reducing negative environmental and social impacts (Clark 2009).

Walker sees, in turn, that an alternative for generating an innovation is to address the issues from the bottom up referring to how products can emerge from and be aligned with new sensibilities, after which one is able to develop a system that supports their effective production. In this view, ‘designing’ is understood as a creative, integrated and iterative process of thinking and doing, which becomes a key element of broader strategic change (Walker 2010). This is easy to understand, since it is the designer’s ability to operate through ‘things’ and ‘systems’ that makes it particularly suitable for dealing with contemporary societal, economic and environmental issues (Fuad-Luke 2009).

To define product innovation more in detail, according to the research of DFS by UNEP in 2006, DFS also encompasses radical innovation6 approaches that target new product development and Product-Service Systems (PSS)7, which challenge current consumption and production patterns by completely rethinking products in light of consumer needs. In the end, the changes to existing products are mainly made on the operational level, while new solutions should also offer value through sustainability and reduce the environmental impact of products and consumption in total. (McDonough 2002).

Unlike the eco-design approach, until now the process of sustainable

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5. A triple bottom line approach to design for sustainability is described by McDonough and Braungart, in which firms balance traditional economic objectives with social and environmental concerns. (Marc A. Rosen et al.2012 Sustainable Manufacturing and Design concepts, Practices and Needs University of Ontario Institute of Technology in US )
production lacks objective criteria to evaluate design processes. This makes it difficult for the SPD to develop and be improved further. Especially the social theme is covering social morality and cultural values, which is a very broad topic at design area. This means that the output of SPD is hard to prove that the process is sustainable, because there is no standard for social effect. For this reason, it is necessary that sustainable design is simplified as a concept with a specific goal. The focus of SPD should be to intentionally support product designers to design sustainable products by defining clearly, what sustainable product design is (See Figure 2-3). In this case a Product Service System (PSS) can be an imperative design tool to maintain the product lifecycle in a certain community. Moreover, by highlighting the importance of maintenance, the products are evaluated more easily and concretely.

Simply put, from an academic view of sustainability, the meanings behind DFS and SPD are synonymous. These design strategies are the aim of sustainability in the end. This means design is one of the tools for sustainable development which is motivated by moral issues such as gender equality and designer’s responsibility. However, to the designers such abstract motivations make design processes more complicated. Especially to the product designers, who have to handle physical material and tangible products, these vague approaches and invisible moral goals might be improved through the design process. For this reason, the specified and objectified goals of SPD can make the design process more explicit. It can be possible to evaluate the outcomes based on the specified goal of SPD. Figure 2-3 presents the specified goal of SPD, which focuses on maintenance. Based on the aim of maintenance, SPD is a tool for maintaining product life cycle and the systemic approach can be one of methods for extending the product life-span.

6. Radical innovation: A high level of uncertainty is associated with radical innovation projects, especially at early stages. Due to high levels of uncertainty, the process cannot be described as an orderly structured process. UNEP (United nations Environment program) Design for Sustainability a practical approach for Developing Economies October 2006 with TU Delft: Paris France

7. PSS (Product-service systems) is on Chapter 6 Sustainable systemic service strategy for the local product design in detail.
In brief, Design For Sustainability (DFS) has been developed based on eco-design and Design For Environment (DFE) concepts. (See Figure 2-2) DFS encompasses creating social values such as corporate social responsibility, business ethics, fair trade and worker protection with it (Rosen and Hossam, 2012). Thus, innovative production development and PSS (UNEP 2006) are imperative areas of SPD to change the embedded unsustainable behaviors.

Furthermore, the design process cannot be successful without the involvement of proper partner companies, industry associations, governmental bodies, non-governmental organization (NGO) and educators. To find and connect partners during the process and involve them in the sustainable product process, co-design is one of the optional design processes that may be used. Mattelmäki defines co-design as a process and the planning, adjusting tools and facilitation that builds on a mindset based on collaboration (Mattelmäki and Visser 2011). The application of co-design approaches offers a means of increasing participation in design processes, and can potentially improve social networking, cohesion and capacity, in order to build resilience and enable future adaptation (Fuad-Luke 2009).

In a nutshell, DFS is a set of dynamic actions that have a minor effect on the environment that increases social values and continuous economic development with innovative solutions for product development processes and seeks sustainable development by forming social partnerships.

2.3 The role of designers in the sustainable era

Designers should act as a translator between disciplines (Spangenberg 1995). A designer makes his or her own definition about what it means to be a designer and how to use distinctive skills, knowledge and thinking of design to find a place in the world. Manzini highlights the scope of current designers by noting that over the last few years, the traditional vision and practice of design and industrial activity have undergone a profound change (Manzini 2004). Nowadays, it is the concept of industrial production itself that has
changed, opening out to new, previously inconceivable possibilities. Industrial production, at least in its most advanced areas, can no longer be taken back to the simplified vision of enterprises that produced material products for undefined, non-localized consumers. Today, industrial production tends to define itself as the realization of complex, interacting systems that emerge from the convergence of numerous different and differently motivated actors (Manzini 2004). Accordingly, designers might have a key role to play in the change towards the sustainable development, since this would not only include the shaping of products and services, but also communicating sustainability demands to the business sector, engineers and investors.

In this era, designers can no more be considered only as shape-creators, but their role has been expanded to a communicator with professional knowledge of production and consumption. That is, the designer in the ecological era has the job to provide choices for people, which should be real and meaningful, allowing people to participate more fully in their own life decisions. And it should be enabling them to communicate with designers and architects.

8. DfE is a synonym for ecodesign, but it can also refer to certain environmental benefits of a product, such as “Design for recycling” or “Design for Disassembly”. In this case, DfE is a sub-concept of ecodesign. (Brezet, et al., 1997; Fuad-Luke, 2002; Simon, et al., 1998).

9. Co creation can take place within co-design processes but focuses much more on the collective creativity of involved users and stakeholders.
Product approaches past and present

in finding solutions to their own problems, even – whether they want to or not– to become their own designers (Papanek 1993). In conclusion, designers of the sustainable era should be creative T-shape professionals\textsuperscript{10}, diving into complicated tasks that wait to be solved.

\subsection*{2.4 Limitations of global sustainability}

Human beings have experienced the expansion of global consumption at a dramatic scale, while the scale continues to grow as it has done since the 1960’s (Robins 1998). As McDonough declare, there were fundamental flaws in the Industrial Revolution’s design, which resulted in some crucial omissions, and devastating consequences that have been handed down to us, along with the dominant assumptions of the era in which the transformation took shape. So, in the end universal design approaches to typical development tend to overwhelm (and ignore) natural and cultural diversity, resulting in less variety and greater homogeneity (McDonough 2002). While industrialization and international trade have transformed and improved lifestyles in all kinds of ways, as we increasingly comprehend their detrimental effects, it becomes important to develop new, rather different ways forward (Walker 2010). For these reasons, sustainable design has been developed based on the principle that product design and development has a pivotal role to play within sustainable consumption and production discussions as it significantly influences the ways that products are produced and consumed (Tischner 2001). Since the 1980s’, the global industrial sector would have been working more and more conscientiously in the direction of sustainable development (Carolien 2001), but the existing regulation focuses on larger industries, as do consumer organizations and environmental agencies (De Bruijn 1992, Dogson and Rothwell 1994).

\textsuperscript{10} “T-shape professionals” are deep problem solvers with expert thinking skills not only in their home discipline, but also they have complex communication skills to interact with specialists from a wide range of disciplines and functional areas (IMF and IBM, 2008)
There are interesting statistics regarding sustainable design from UK which supports this claim. Namely, 59% of designers say they feel well equipped to advise clients on sustainable design practices; but there are still underlying problems that need to be resolved, because reducing the overall impact of products and services is hugely complex and not yet fully understood by designers or clients\textsuperscript{11}. Clark points out that the biased globalized approaches of DFS in the 1990s, such as eco-design and green product designs, were introduced as strategies, which companies could employ to reduce the environmental impacts associated with their production processes. While these processes have been successful in helping industry in developed nations improve production efficiency, they have largely ignored practical applications (Clark 2009). Moreover from the perspective of resiliency, centralization is often less sustainable while decentralized systems for everything from manufacturing to distribution to energy generation to political rule tend to be more sustainable (Shedroff 2008).

In conclusion, sustainable development requires integrating economic, social, cultural, political and ecological factors (UNCED 1992), while we must simultaneously take into consideration the local and the global dimensions and of the way they interact (Gallopin 2003). Since the 1970’s a lot of efforts for sustainable development have been processed and developed world-wide. But mostly it was at the macro levels (global companies, NGOs, universities, governmental regulations and policies, global standards for eco-design, accurate assessments etc). Without a holistic approach merging globalization and localization together, sustainable development can be a house of cards. That is, in order to reach the ultimate goal of sustainable development, diverse micro local approaches have to be planned and implemented at the same time with the macro level decisions and policies. As put by Manzini, cosmopolitan localism generates, and is generated by, a new sense of place: a place that is no longer an almost isolated entity but a knot in a network (Manzini 2004).

\textsuperscript{11} Design industry insights in UK 2010 p 19.
Such place emerges from a combination of small scale (the local roots of an activity) and its links with a wide range as an open system of exchange, to which flow gives a special cosmopolitan character (De Ria & Bonomi 1998). This new sense of place also generates new forms of organization in production systems (drawing from Manzini 2004). This research was strongly aimed at the micro approach, which is decentralized local design for balanced sustainable development.
3. TOWARDS SUSTAINABLE LOCAL PRODUCTS

Defining a local product
Roles of a local designer
Previous approaches to local products
Practical approaches for sustainable new local design

3.1 Defining of a local product

Sustainable development needs to change the current patterns of production and consumption from both the technological and the behavioral point of view (Masera 2002). The active subject, which guides us to this change of behavior, is not only mindset but also the technology that may offer us incentives to leave behind our current behavior and replace it with new, sustainable practices. So, when it comes to defining sustainable local products, we have to start from defining the level at which one initiates development of one initiates development of the sustainable products. That is, the micro level and the moments of local practices. It is important to notice that local practices differ from culture to culture, from climate to climate and hence, local designs can only be designed in a practical context in the actual environment where one can engage in dialogue with local users.
What makes local products sustainable then? Firstly, one must define the concept sustainability as seen through the eyes of designers in this context. Accordingly, as defined by Morelli, sustainability implies a double challenge for designers. The first is a technical challenge taking place in the short-term (in the existing production and consumption system), that derives from the need to reduce the environmental impact of modern society by improving existing products (Morelli 2004). The second is a long-term challenge (future perspectives), that involves a thorough analysis of many possible futures, in search of sustainable and desirable directions to follow, starting from the present. Further, when approaching the definition of sustainable product design, it is important to acknowledge the role of design in creating social equality. A good example of design promoting social equality is Victor Papanek’s proposal,\(^1\) which proposes cultural, professional and methodological insights into design for the market and cuts across different disciplinary areas from social sciences to management and from engineering to semiotics (Margolin 2002).

McDonough sees that all sustainability is local, since sustainability cannot be externally imposed through a one-size-fits-all approach (MaDonough 2002). In conjunction with international agreements and regulation, progress of sustainability depends on growing a culture of sustainability that is sensitive to the specificities of locality (Van der Ryn 1996). This in turn goes well together with Manzini’s idea illustrating systems where globalization processes go hand in hand with localization processes (Manzini 2004). Even though we believe we are able to affect and master the macro level above us, the globalization processes and their outcomes are so tremendous by size that we do not have a grip to control them if we do not touch the field and engage in micro level practice, the processes of localization.

### 3.1.1 The concept of sustainable local product design

\(^{1}\) In 1972, Victor Papanek proposed a new design agenda focusing on designers’ responsibilities towards environmental and social needs.
Local design actually refers to integrating new functions (through design) to local society. However, a designer cannot know what these functions are if he or she doesn’t experience the local, currently existing functions first. In general, the first step of the problem solving process\textsuperscript{2} is defining the problem by mapping the problem in a certain local area and investigating it within these physical boundaries. Naturally, in the local context of Africa for instance, lack of facilities, resources and knowledge prohibit the solving process. Further, the solutions for obstacles in the local area may be unconnected to the culture (McDonough 2002) and cause social disagreement (James 1997).

Values are another essential component of sustainable local design. Every territory has its own heritage of territorial values, legacy of its natural and social history (Magnaghi 2000), and this is what distinguishes sustainable local design from sustainable design, where values are more those related to environment and eco-design. However, in the case of sustainable local design, valuing of a local resource is a social learning process by which a community can become self-aware and learn to recognize and exploit its resources in a sustainable way (Manzini 2004). Values guiding sustainable local design are not only in the products, the outcomes of design, but also in their users, who actually are empowered as creators of the outcomes. This means understanding customers’ culture; who they are, where they live and how they are different from other local areas. Understanding, merging with and connecting to local culture have to be embedded in the local design process. Walker, for instance, sees connecting the diverse local culture connection to the design process resulting in social equity and justice, cultural significance, personal identity, environmental responsibility and economic viability, which all become embedded, mutually dependent facets within a diverse, democratized approach to the production and continual re-articulation of material culture (Walker 2010).

Although embedding the cultural values to the design process sounds like a very clear solution, creating social values is very subjective and complex. Hence, the biggest challenge to the designers who work with SLPD (sustainable local product design), is how to objectify subjective cultural values to more tangible values, and how to apply the local values into their design process. Those are the creative and innovative ways of SLPD. The process (see Figure 3-1) starts from objectifying the local issues, which can be social issues, environmental issues, customer needs, new business ideation and so on. In this step, understanding the local issues with a designer’s perspectives and identifying the problems, which can be solved with the SLPD process, are the key points. The next step is the actual problem-solving design process from the objectified local issues. This process is an innovative design process based on the designer’s inspiration, creativeness and even fortuity, which is an unexpected combination. Detailed practice of the design approach will be covered in Chapter 4 with a case study.

The biggest difference between general design approach and sustainable approach is the systems perspective. Shedroff commented that, “the only way to approach sustainability effectively is from a systems perspective. (Shedroff 2008)” But this is the most difficult and challenging part of sustainable product design. The product service systems step is for searching and suggesting pertinent stakeholder relationships, even simple systemic plans, not huge and complicated service systems. The last process is feedback. There is a lack of tools for evaluating holistic sustainable approaches till now, especially for the micro design process from SMEs. However periodically, you should evaluate whether you’re truly working on a solution at the right level to make the change intended. (Shedroff 2008) For this reason, simple local feedbacks such as user comments can be helpful for improving the product quality in the process. Nonetheless, for developing sustainable products, the objective assessment tool is necessary and this issue will be dealt with in Chapter 6, which describes strategies for sustainability.

3. The systemic approach is not easy because it is still often not good enough for many clients, companies, or business people who just don’t understand why these issues should be dealt with by themselves and their business. (Shedroff, 2008)
In brief, the first stage of SLPD is integrating oneself to the local culture and carrying out, objectification. The second stage is SLPD in which one practices, simplification, and the third stage is product service system in which one, uses a simple communication method for obtaining practical feedback.

**3.1.2 The concept of Socially Responsible Design (SRD)**

The only option that makes sense in the long-term is to pursue sustainability for the whole socio–ecological system. The rationale for considering the whole system, in turn, is based upon the existence of important inter-linkages between society and nature (Gallopin 2003). Although some companies have recently started eco-design activities, social and ethical aspects are not usually integrated into product development processes (drawing from Tischner 2001). For any product, which is to be considered ‘sustainable’, factors that can directly or indirectly affect socio-economic equity and the natural environment must be carefully contemplated and analyzed. One way to do this might be to create products that are long lasting (Chapman 2005), whereas Manzini sees
that local action also reduces material movements of goods and materials (this in turn reduces the environmental impact of the production and consumption system) and reinforces the links between individuals in the social community, thus increasing social cohesion at the local level (Manzini 2000). This means that local actions should have an effect on the social community in a way that design for sustainable local products ends up playing the role of socially responsible design. For improving the quality of local life, holistic and diverse approaches that are covering social issues, economic values and social needs should be included at the innovative design approaches. Figure 3-2 shows the criteria shaping the concept of Socially Responsible Design. Eight tenets-Crime, Government, Economic Policy, Fair Trade, Ecology, Social inclusion, Health and Education- can be emergent social issues, which have to be handled by socially responsible design. The general issues can be applied for improving

Figure 3-2. The eight tenets of sociality responsible design (Davey 2004)
any social lives not only for the sustainable local design process. However, SLPD is strongly connected with the social problems shown in the Figure 3-2. Hence, when the designer starts to design SLPD, these social issues have to be considered even at a low level.

### 3.2 Roles of a local designer

According to Papanek, the responsible role of a local designer in solving specific problems is to provide choices for people, that are real and meaningful, allowing people to participate more fully in their own life decisions, and enabling them to communicate with designers and architects in finding solutions to their own problems, even – whether they want to or not – to become their own designers (Papanek 1993). In fact, these cultural characteristics important for local designers might actually not be evident or consciously produced by local people producing these characteristics or living in the local community (Drawing from Thackara 2010). Naturally, local people may face challenges in their communities that are very difficult to overcome through design changes. On the other hand, local designers and entrepreneurs should see these obstacles as opportunities to create new values aiming at sustainable local development. As the job of designer is acting as a socially innovative communicator, in the field of local design, designers can play a role as a knowledge activist, as: Catalysts of knowledge creation, Connectors of knowledge creation initiatives and Merchants of foresight (Von Krogh 1997).

#### 3.2.1 Sustainable Local Product Design of SMEs

To the small-scale independent designers, small and medium sized enterprises (SMEs) offer many opportunities as an activator for orienting society towards greater sustainability. Recently, the UNEP has encouraged the role of SMEs in

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4. The World Bank defines medium-sized enterprises as those smaller than 250 employees and small enterprises as those with less than 50 employees. At the lower end of the SME sector, micro enterprises consist of companies made of self-employed firms and those with less than 10 employees. 2% is big agency, 11% is medium agency and 87% is small agency in UK. (Design industry insights in UK 2010)
the SPD design field, because SMEs are the backbone of the private sector and have a significant role to play in economic development in general. Namely, they share a number of characteristics that make them attractive for targeting innovation projects, since they are able to react quickly and efficiently to market changes and they can function as a powerful engine for economic growth and performance. (See Figure 3-3)

However, SMEs globally are fragmented and heterogeneous and thus SMEs need to be effectively connected with global markets to find buyers for their products and suppliers for their inputs. This, in turn, requires developing skills, technology, information and research, all of which can benefit from partnerships, be they amongst SMEs themselves or between SMEs and large enterprises (UNEP 2005). Here innovation can act as a bridge to these kinds of projects especially in developing economies, where SMEs often offer the only realistic prospects for increasing employment and adding value. In short, SMEs can contribute to local sustainability for the following reasons:

Figure 3-3. SMEs contribution to the employment and GDP* (World Bank, 2007)

* From World Bank Corporate Sustainability (2007) report in that in OECD economies, SMEs and microenterprises account for over 95% of firms, 60-70% of employment, 55% of GDP and generate new jobs. Especially DFS can be used in small-and medium-sized enterprises (SMEs) in developing countries, which have economies that offer few incentives or support for innovation.
1) SMEs tend to lead to a more equitable distribution of income than larger enterprises. In addition, they are less concentrated in urban areas than the larger companies and thus create employment in rural areas.

2) SMEs contribute to a more efficient allocation of resources in developing economies. They often adopt labor-intensive production methods and thus reflect the resource endowment in developing economies where labor is plentiful and capital is scarce.

3) SMEs support the building of productive capacities. They help to absorb productive resources at all levels of the economy and contribute to the establishment of dynamic and resilient economic systems in which small and large firms are interlinked.

4) SMEs in developing economies suffer from problems such as the lack of: capital, access to markets, finance, qualified personnel, training, and technological and marketing capabilities.

SMEs have local knowledge, understanding about domestic consumer demands, and they have access to remote regions. At the same time, they can strengthen their own distribution networks and open up new markets for their products (WBCSD 2007). Thus, sustainability criteria at the micro level cannot only be directed from macro level in a top-down fashion. By contrast, the product development processes of SMEs can work highly efficiently and effectively towards the target of the local society, when industry, government, non-governmental organizations work together (Kleisterlee 2007).

3.2.2 Challenge of the SMEs

For SMEs, sustainable business development, is a relatively new area, and its implementation, is still limited (Cramer 2002). According to Ricardo, a lack of knowledge, awareness and investments are barriers for moving towards sustainable practices and more responsible business in SMEs today (Ricardo 2012). For example, the lack of mentorship and skills transfer, the lack of support networks, poor infrastructure, a low savings rate and the difficulties accessing
Towards sustainable local products

financial capital are common weaknesses for SMEs in developing economies (Ciliberti 2008). Also, the lack of awareness of environmental legislation and social impacts derived from industrial activity may result obstacles to develop sustainable business in SMEs. Curiously, according to UNEP research in 2005, SMEs in developing economies have different attitudes towards product design compared to SMEs in developed economies. Some of the observed differences are:

- **A tendency to design incremental improvements for existing products**
- **Concern with product appearance over product function**
- **An approach to design based on a tradition of technology import rather than a tradition of invention or innovation**
- **A tendency not to design solutions that have no precedence in the market place (international and local)**
- **Lack of tools and experience to compare and evaluate alternative approaches to design problems**
- **Difficulty in developing clear project briefs. These aspects highlight the need to build capacity in product development**

In brief, the potential of SMEs should include local production, local talent development and local entrepreneurship. At the same time, micro strategy development needs to identify of goals that are more specific (Spangenberg 1995). When localization becomes an important aspect of a product’s creation, the designer’s decisions become related more to the local and the regional context. This is an aspect of design that has become far less prominent within contemporary, globalized production systems (Walker 2010).

### 3.3 Previous approaches to local products

When it comes to the previous approaches to local products, an industrial design approach involving appropriate technology is a one example from the
past. The first exhibition of Design for the other 90% was organized in the US collecting projects recalling the fact that of the world’s total population of 6.5 billion, 5.8 billion people, or 90%, have little or no access to most of the products and services many of us take for granted, while in fact, nearly half do not have regular access to food, clean water, or shelter. Hence, design for the other 90% explores a growing movement among designers to design low-cost solutions for this other 90%5. In the exhibition, the focus is to introduce humanity-centered design projects for addressing the social problems mostly in less developed countries. The aim is that these projects would be inspiring and motivating to NGOs, many young designers and social entrepreneurs, who want to design meaningful works to overcome poverty in the world.

An example of this approach is the representative case of Design for 90% is OLPC (one laptop per child) designed by Yves Behar in the Fuse project in Germany in 2007. The strategy of the project is that an inexpensive, universal laptop computer as an educational tool for school-aged children in developing countries was created to spread optimistic spirit. For the $100 laptop, one gets the most advanced technologies and high design (Fuse project 2007). However, David who is a design critic in US severely criticizes these design approaches by mentioning three fallacies, which are remote experience, instrumentalization and gargantuan thinking6.

Another previous approach is the recycling concept, where eco-design is believed to be able to contribute to most of the goals (eco-efficient and reducing resource consumption) be it in terms of promoting eco efficiency and resource productivity or in terms of the production of environmentally and socially sound attractive goods and services (eco-design also read as ‘economically viable design’). Further, this previous approach to local products is considered to help in modifying consumption patterns, since as with a changing fiscal framework eco designed products will probably be cheaper than conventional ones (Spangenberg 1995).

5. “Design for 90% others” the exhibition and collected projects can be seen at the website <http://designother90.org/>
6. The critics by David Stairs can be seen through the web page and blog in detail <http://www.experientia.com/blog/design-for-the-other-90-controversy/>
An example of this recycling concept in Nordic countries is Globe Hope from Finland. The idea of Globe Hope was born in 2001 from fashion designer Seija Lukkala. Globe Hope’s main goal is to design goods that are aesthetic, functional and idea-rich by using recycled materials. Globe Hope’s ideology can be summarized in three keywords: ecology, ethics and aesthetics\(^7\). It is possible that a recycling business could be successful because of the highly developed ethical customer culture in Nordic countries not only from the perspective of dematerialization, but also increasing cultural values. Hence, recycling and reuse design concepts could provide many opportunities for SME designers.

However, this concept also has some limitations. Recycling is more expensive for communities than it needs to be, partly because recycling and down-cycling tries to force materials into more lifetimes than they were originally designed for, a complicated and messy conversion and one that itself expends energy and resources (William 2002). This means that the high cost of the design is mostly due to unstable recycled material supply flow.

The third previous approach to local product is the craft driven concept, which has been developed based on social equality and empowering local businesses. In this design approach, the relationship between designer, who has been trained in trendy aesthetic sensibilities, and local artisans, who have special handy craft skills, are the most important. A good example case of craft driven approach comes from the European design Mifuko of Finland, which originated from design entrepreneurs Minna Impiö and Mari Martikainen, who established the shop in 2009. Their product design is based on strong experience with local cultures in Nairobi, Kenya. They describe the spirit of Mifuko that it works in a Helsinki-Nairobi-axis. Even though the designs come from Finnish artists, products are inspired by colors, textures and vibrancy from Africa, especially Kenya. Every product is designed in such a way that it represents traditional craftsmanship as well as available materials. Impiö and Martikainen confirm (2012) that they know almost all of the Mifuko

\(^7\) Recycling design approach from Globe hope, webpage <www.globehope.com>
 artisans by name, and hope to employ more and more Kenyans, offering them a regular income and good working conditions. In this business case, the most challenging thing is practical influence on the real local economy.

3.4 Practical approaches for sustainable new local design

Sustainable local product design (SLPD) is an obvious challenge to SMEs to take actions in any places all over the world. Their design process is totally based on learning by doing through the whole process, because from the first step of researching local issues to the end of sale of the products, they have to experience and learn by themselves in the real fields, as innovative activists and communicators. The valorization of a local resource is a social learning process by which a community can become self-aware and learn to recognize and exploit its resources in a sustainable way (Manzini 2004). Accordingly, he distinguishes three fundamental moves for this activity: (Manzini 2004)

1) Discovery of a potential resource: Identifying one or more territorial values that can be seen as a potential resource, Finding a starting point, a window of opportunity where we can start up the action

2) Valorization: Clarifying a shared vision and a feasible approach, building one or more scenarios showing how the resource could be developed, setting up a network of converging interests around it, with a wide social consensus

3) Cultivation: A sustainable management system of the resource itself, regenerative use that enables it to be exploited in a non-destructive way

These three moves outline the fundamental stages in an overall process that can be defined as the social construction of a local development project (Manzini 2004). From the side on the SLPD, Manzini’s three moves seem similar to those the sustainable local product design process that starts from objectifying the cultural issue, designing proper local solutions and systemic

8. Craft driven design approach from Mifuko, webpage<http://www.mifuko.fi>
approaches for developing the quality of the products. (see Figure 3-1 The holistic process of Sustainable Local Product Design)

As shown in Figure 3-4, the biggest difference between the local and global approach to sustainable development is that the local one carries strong power of diverse culture value. Even though McDonough and Braungart (2002) state that all sustainability is local, cultural disagreement makes the design process unclear (James 1997). Due to this, in the SLPD process, objectifying the invisible cultural issues to tangible values is the biggest challenge as well as an opportunity for the designers and SMEs. Figure 3-4 presents the possible solution of SLPD, a new combination with new cultural materials processed through proper skills. Searching out the cultural material is not a totally new idea, but observing the new possibilities from the local material should be the result of a designer’s talent, even though the material would have been used many times and in many ways already. This point makes the product special and that is why this should be encouraged for designers.

The specific alternative approach of SLPD (Figure 3-5) is based on primary product design development (Tischner 2001) and the new ideation parts are added from the WBCSD 2007 research for innovative sustainable design process. The design process (selection, ideation, prototyping, manufacturing and sales) should be on the iteration loop from proper feedback channels such as

![Figure 3-4. Possible solution of SLPD (Joong yeol 2013)](image-url)
as local consumer research. The process consists of three parts from Enzio Manzini’s three fundamental moves for activity (Manzini 2004). The most important point of this process is to connect social and cultural values as much as possible during and after the process.

3.4.1 Design from learning on the ground
Design activism is “design thinking, imagination and practice applied knowingly or unknowingly to create a counter-narrative aimed at generating and balancing positive social, institutional, environmental and/or economic change” (Fuad-Luke, 2009 P12), whereas co-design offers an opportunity for multi-stakeholders and actors to collectively define the context and problem and in doing so improve the chances of a design outcome being effective. Chance connections and relationships occur to the designer within an immersive process in which the ‘doing’ of design takes place in conjunction with thinking about and researching issues of concern. This symbiotic process of thinking-and-doing enables the thinking about issues of concern to inform the ‘doing,’ and the doing and reflecting on the processes and outcomes of doing to inform one’s understanding of the issues and their design implications (Walker 2010).

3.4.2 Systemic approach
Shedroff mentioned that sustainability is about efficiency, so that the only way to approach sustainability effectively is from a systems perspective (Shedroff 2008). He stressed the motivations of stakeholders with regard for sustainable development. The maintenance of the local business and product-service system is impossible without strong motivation. Of course, the motivation for maintaining the production system and service can differ depending on the type of stakeholders involved in the system. For example, the motivation of NGOs is mostly non-profitable devotion to society. In the case of the company, the motivation is at the opposite side of NGO’s. Figure 3-6 below demonstrates how motivations develop and create themselves during the construction
Figure 3-5: Local product design process (drawing from Tischner 2001; WBCSD 2007)
process of the SLPD service system. As a result, we see that motivation grows along with new ‘ingredients’ participating in the SLPD service system. Actually this motivation can make the sustainability of a product system possible in the end. The product service systems will be covered in Chapter 6 under the topic of sustainable strategy.

3.4.3 Required acceptance for SLPD

Nevertheless, there are certain aspects, which are often taken for granted, but which should be explicitly defined in order to make the design process and product service system of SLPDs clearer. The aim of these five acceptances is for SME designers to design SLPD with keeping in mind that the main point of the sustainable product is the maintenance of product life cycle in systemically without, paying too much attention to any one aspect. (see Figure 2-3)

Firstly, local designers need not be local people. Designers with local contexts are not necessarily local artisans. As the design concerns shown in Figure 3-7 demonstrates, a product designer can be considered a designer who understands local production context and local culture not based on their
nationality. Secondly, **local needs are not totally different from global needs.** This means that in general designers do the effort to find special design for local needs. However living in a globalized world, discerning local needs and global needs are meaningless and time consuming to do actively. Thirdly, **local material is not necessarily eco-material.** Namely, local material is material, which can be supplied easily and quickly from the vicinity. It is not necessarily locally produced or natural material and non-toxic. The most important goal of SLPD is to maintain the product cycle with a systemic approach (see Figure 2-3), not judged by eco-design assessments. That is why creative innovation for improving the life cycle in the system and up-cycling the material by adding social value is the main challenge of SLPD. Fourth, **local skill is not necessarily an indigenous skill.** Local production lines are not based on a slow handcraft skill. Handcraft is obviously one of the precious cultural heritages to be preserved well. It is not always, however, the best solution for local production and the local economy, because it is typically less efficient. Thus, in the globalized world, indigenous skill is not a mean of original cultural heritage, but in turn its role should be the source of innovation of how to optimize the skill for the new products. Fifth, **local people’s money is not necessarily from the local market.** If the local money flow is within the local market, the proportion of shared money from the small market will be smaller and smaller. So it is hard to improve local lives with this money. In turn, local brands can later be internationalized brands for scaling up into bigger markets. Figure 3-7 presents five elements within three main sustainable pillars. The issues are listed together with their solutions.
Figure 3-7. Five required acceptance and substitutions for SLPD (Joong yeol 2013)

- Local people's money is not necessarily from the local market.
- Local designers need not be local people.
- Local needs are not totally different from global needs.
- Local skill is not necessarily an indigenous skill.
- Local material is not necessarily eco-material.

- **Economic values**
- **Cultural assimilation**
- **No prejudice**
- **Innovative and fresh idea**
- **Diverse approaches**

Diagram: SLPD (Sustainable Local Product Development)

In the context of Sustainable Local Product Development (SLPD), the diagram highlights the importance of various factors:

- **Economic values**: The economic benefits derived from local production.
- **Cultural assimilation**: The integration of cultural aspects into the development process.
- **No prejudice**: The absence of prejudice in the selection of local materials.
- **Innovative and fresh idea**: The introduction of new and innovative ideas.
- **Diverse approaches**: The use of different methods and techniques.
- **Local market**: The significance of local funding sources.
- **Local designers**: Flexibility in the design process.
- **Local needs**: Aligning with global needs.
- **Local skill**: Not necessarily an indigenous skill.
- **Local material**: Eco-materiality not necessarily required.

Source: Joong yeol 2013
4. BEAM PROJECT / FIELD RESEARCH

The aim of the project
Project plan
Product design methodology

BEAM project means a light and joyful project of sustainable local product development. The BEAM project is aiming at a basic structure for local product design process for micro designers and SMEs.

4.1 The aim of the field research

In this sustainable era, the main questions and aims of the work of designers and non-designers should be what and how products must be designed or redesigned to promote sustainable development (Reis & Wiedemann 2009). Accordingly, these are also the major aims and topics of this thesis. Its data collection is based on fieldwork conducted in Uganda, Africa. To contribute to sustainability, the designer has to consider how products can be developed so as to be environmentally and socio-economically responsible even though

1. A ray or shaft of light, from Oxford dictionary
they are in a continuous process of change (Porritt 2007). From the point of view of this research as well as fieldwork in Africa, the major aim is thus to seek the sustainability of the whole socio-ecological system\(^2\). The rationale for considering the whole system is based upon the existence of important inter-linkages between society and nature (Gallopín 2003).

However, there is a gap between reality and the literature. That is why the research data collection in this thesis is based on acknowledging the gaps between theoretical knowledge and real conditions and seeking understanding regarding, what those micro level problems, conditions and opportunities are in the local context and who those people are in reality to whom we seek to design solutions in the developed societies. That is, the aim of the field research named as BEAM project, has the role of not only gathering knowledge about the local environment, but also feeling the local spirit of local people and understanding the socio-ecological system, in which certain problems occur. Namely, sustainable local design can only be designed by empowering the local experience as the key part of the design process.

### 4.1.1 Sustainable product design in the context of reality and practice

As already discussed in chapter 2, the existing regulation from biased globalized approaches of Design For Sustainability focuses on larger industries, as do consumer organizations and environmental agencies (De Bruijn 1992, Dogson and Rothwell 1994). This means that diverse micro and local design approaches should be planned and implemented at the same time as the macro level regulation in order to balance the sustainable development. Accordingly, as suggested in chapter 3, the sustainable local product design (SLPD) process may offer a solution for a bottom-up approach to sustainable development. The key point of the SLPD is to objectify the local cultural values and integrate them as part of the whole design process as much as designer (and non-designer) can accept or is capable of integrating. In practice, this

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\(^2\) According to Systems theories from Jamshed, there are five systems principles are defined as the essential characteristics and the behaviors of a socio-cultural system: openness, purposefulness, multidimensionality, emergent property and counter-intuitiveness (Jamshid Gharajedaghi 1999).
means applying the design on the simplified system by connecting stakeholders and then evaluating the design and system based on an optimized assessment method of local sustainable design.

The BEAM project, completed through field research in Uganda, Africa sets its aim at developing the SLPD process based on the findings obtained in the local context, and in real conditions. This means searching out the obstacles for sustainable design as a micro level approach, examining how to change and customize the process to the local conditions and what the role of a designer in the local area is from the viewpoint of SLPD. These are the aims of this field research. Therefore, the choice of the target local area for this research was very important and it thus follows the advice of Clark, who see that while the macro processes promoting sustainable development have been successful in helping industry in the developed nations to improve production efficiency, they have largely ignored practical applications in the developing world (Clark 2009).

Papanek’s idea about designer’s responsibility should not mean that all designers have to design radios from used steel cans in a developed country, but it is true that in the case of developing countries, creative and innovative sustainable local design approaches are strongly necessary compared to other cases (Papanek 1971). Thackara pointed out that distance is dead, geography is obsolete, local design expands its meaning as designing with locals and not for locals (Thackara 2004). This also means designing in developing countries is no longer purely left to the work of NGOs, charity events and university level projects, but it is increasingly a playground for designers to engage in the micro approach to promote the SLPD and strive for sustainable development as a whole.

4.1.2 An encounter with the reality in Kampala, Uganda

There are two main reasons, why Kampala, the capital city of Uganda, was chosen as the target local area of this field research. Firstly, Uganda is one of the third world economies that belongs to the East African community that
comprises five countries, namely: Uganda, Kenya, Tanzania, Rwanda, and Burundi. It is poor and the economy lacks proper manufacturing systems. The role of designers is not clear in a society, that does not see design as part of the functions of the societal system, but rather as a stream of art serving only aesthetic needs.

Furthermore, Uganda belongs to those countries with very limited local production; most of the consumer goods and products in general are imported from abroad. For local products this is problematic, since they have no visibility or value in people’s everyday lives and are mostly related to handcraft driven design. When it comes to design education, it is almost fully based on fine art and crafting skills. That is why design may offer lots of solutions for such a society, which has not exploited yet the opportunities, which design can bring to the people as well as what people may have (e.g. due to their handcraft skills) to offer society. That is, design can work as a two-directional bridge between the society and its citizens.

From the history of Uganda, the country became independent in 1962 after being colonized by the United Kingdom for many decades. As a result, the official languages are Swahili and English. Even though the country is landlocked, the economy is growing very fast due to the governmental stability compared to other countries in East Africa. However, the main industry is agriculture, which requires less infrastructure than is required under a more industrialized system. In the case of the manufacturing system, methods of producing everyday products are less developed to fulfill local needs. This means that most of the products are imported from other countries. Systemically, most of the industries still depend on manual labor. This means that in the local conditions it is very hard to produce products that meet the requirements and qualifications of an industrial system. Nevertheless, the Ugandan market and consumer base are growing at an increasingly fast pace.

The second reason for choosing Uganda as the target area of this thesis research is that the service systems are still less productive and at a poor level. Even water supply and electricity, which belong to the primary city
Field research about local design in Uganda

infrastructure, are not sufficient. Hence, from the systemic perspective, Ugandan society is not yet a very complex system compared to other countries such as Finland, South Korea and so on. This means that there are many possibilities for sustainable designers not only in terms of ethical sustainability, but also in terms of creating systemic approaches to the local area. Currently the stakeholders involved are those parties, which can be found easily in the local environment, NGOs, educational institutions, local communities, and local markets. When it comes to the social links between them, it is not difficult to understand clearly the connections between the parties. On top of this, the social infrastructure such as mobile connections, internet technology and public transportation are much less undeveloped, which means that it is possible still to recognize what might be wrong processes when designing product-service systems (PSS) in such a context.

4.2 Project plan

Regarding the schedule of the BEAM project in Kampala, Uganda, it was planned and completed from 10th of March to 27th of June, during 111 Days in 2012. Figure 4-1 demonstrates the development of the whole project plan. The plan is based on Ackoff’s interactive planning and idealized design, which is then combined with the SLPD process suggested in chapter 3.

The aim of the project plan and its situational analysis is to research local conditions. It consists of three parts; firstly, it analyzes living conditions taking into account education, art and design. That is, what products local people are using, which main problems they face and what the general knowledge of art and design is. Secondly, the project plan and its product and market analysis is concerned with questions such as what the material logistics are like, what products are imported and spread to the small vendors and how workers are working. Thirdly, the project plan concentrates on analyzing and seeking social connections in the local community. That is, which associations exist and what systemic connections are linked to each other. Especially, the core question in
Figure 4-1. Interactive planning flow (Drawing from Ackoff, 2001)
the situational analysis is how the systems work in the community.

As shown in Figure 4-1, in the stage of realization, the main problem is what can be the target on which the designer wants to focus on. Here, the target must be decided upon. This realization planning is preparation for the design action. This includes Means planning, Resource planning and Design controls. In this stage of realization, one must ask what kind of tools can be used for the design process which materials are easily available from the local market and finally, how one can create cultural values through the local product. After this realization stage, target products, proper skills and, materials are selected. However, the merging process of local cultural values should continue throughout the whole process of the project, not only in the design process. Actually, the conversion of local cultural and social values has been the key issue in the previous approaches, and it is also a core factor in the new local design approach.

The final stage of the project plan is the design process. In the SLPD process suggested in chapter 3, the crucial core of the whole research is to extend the lifecycle of the products, which might be designed with cultural values. From the viewpoint of SMEs, the BEAM project is in fact the entire process from the stage of ideation to the stage of sales of the outcome product. This means that prototyping is not the last process of the project. In the end, one also collects local feedback and then integrates this feedback as part of the product service system.

4.3 Product design methodology

In terms of the product design methodology, the process of the BEAM project is based on dynamic, interactive local experience, which is learning by doing and, applying SLPD concepts to the local culture. This follows the three sustainable pillars. So, this field research is actually not based on published statistics of the local area or purely drawn from academic scientific research methodologies. By contrast, the project plan is processed based on the project methodology, which in turn consists of three parts and specified methods including
1) Problem searching 2) Product development and 3) System connection. Figure 4-2 illustrates this triangle of methods:

1. Tools for Problem searching are Personal experience by doing action, interviews with real designers and expected stakeholders and a personal diary for keeping a record of the works observed on each specific day. This step is for searching out the strong motivations to design.
2. The product design process is at the ideation level, sketching and prototyping. (See Figure 4-4 below)
3. The next step is for systemic approaches for maintaining the product life cycle. The tools for this level is social connection with proper stakeholders, system map and system prototyping.

The three main processes are developed based on three main concepts of sustainability.
4.3.1 Searing for problems

The first step is searching for the problems to find the proper motivation for an effective design. In this stage, the situational analysis and meaning planning are planned in order to understand the local culture. This includes methods such as collecting experience, meeting the local people as much as the designer (or planner) can and documenting the actions through the learning diary. The aim of this step is to define pre-actions for the product design development. Namely, finding a design focus should be a strong motivation to the next design process and systemic approaches in the end. The target problem in this case can be any theme such as serious social issues, new business strategies or preserving cultural heritage. These findings should increase the motivation for creative and innovative views of talented designers or SMEs.

In the case of Kampala, the stakeholders and institutional parties needed to approach the target problems were found to be education, market, service environment, actors, associations and the community.

1. **Education**
   - Art & Design / There are two main art and design universities in Kampala; Makarere and Kyambogo University.
   - Vocational school / Kyebando, Lugogo and Nakawa vocational school

2. **Market**
   - Products / Local central market, Shopping center
   - Material / Local central market, Craft shops

3. **Services Environment**
   - City infrastructure / Public transportation
   - Manufacture / Producing company, Small private manufacturing like steel bending, welding and wooden furniture works
4. **Service Actors**

Providers / Company level service providers, NGO associations and governmental service providers

Consumers / Small income local consumers, middle and upper level local consumers, beneficiaries from NGOs, global consumers who are tourists mostly

5. **Associations**

Educational association / Vocational training schools, Universities, community training association, NGO level training

NGO association / Child concerned NGOs, Christian religion NGO activities concerned with profitable business

6. **Community**

Artists / Painting, sculpture, graphic, eco material artist and designers

Local Women / Volunteer association for training vulnerable women, NGO training community

The interconnections between social problems are not analyzed in this field research, but these can be a “Discovery of a potential resource” (Manzini 2004) as starting points for taking design actions.

4.3.2. **Product Design Process**

In SLPD, objectifying the invisible cultural issues to tangible values is the biggest challenge as well as opportunity for the designers and SMEs. (See chapter 3, 3.4 Practical approaches for sustainable new local design) In the case of Kampala, the step of Product Design Process starts at the local vocational school and experiences from local life conditions. Figure 4-3 shows a specified SLPD process from chapter 3, which means that the design process starts from selecting the problem, means and materials. Co-creation with local people for collecting useful information and stakeholders is the main process
Field research about local design in Uganda

Figure 4-3. New combination of Sustainable Local Product Design (Joong yeol 2013)

to be analyzed in this stage. Naturally, designer’s choice, intuitions and a sense of aesthetic strongly affect the process. In the SLPD process, product design step is a process of merging or diving into the local culture. At the same time, the biggest challenge of the design part here is to understand, what kind of design approaches, appropriate technologies (e.g. craft driven, user driven) should be chosen and developed. Of course, this process should have an outcome of design that is creative and unique. Thereby, ideation, sketching and prototyping are the main methods for the process in this stage. Especially, prototyping is the pragmatic action to improve the quality of the design. A more detailed design process of the BEAM project is described in chapter 5 (Product development process). Figure 4-4 demonstrates the SLPD design process stages and their connectedness to the context and the stakeholders. In this field research, the design process is done from ideation and, prototyping to find proper manufacturing solutions in the local area.

4.3.3 System connection

When it comes to connecting the system, the most different and creative part of SLPD is designing the future plan and connecting the stakeholders systemically.
This system approach will be based on SSM (Soft Systems methodology)\(^3\). More simply put, the SSM is taking purposeful action models through the problems solving process of systemic thinking with many worldviews within the environmental constrains. In this step, the main methods to connect stakeholders into the same system are rough mockups helping designers to make ideas tangible, iterating quickly at a low cost and drawing a system map. Chapter 6 (Sustainable strategy) describes more profoundly the product service system developed in the BEAM project. Also, further details concerning this process stage may be found in the learning diary blog at http://beamproject2012.wordpress.com/.

\(^3\) SSM (Soft Systems methodology) is taking purposeful action models through the problems solving process of systemic thinking with many worldviews within the environmental constrains.
As described in chapters 3 and 4, the key to designing a local product process is seen in this master’s thesis to be the new combination of materials, which embed cultural issues (e.g. values, norms, traditions, beliefs) and make proper local skills explicit. In this product development process, five essential aspects should be taken into account. Firstly, local designers are not necessarily local people and local needs are actually not different from global needs. Further, local material is not necessarily eco-material and local skill is not necessarily an indigenous skill. Finally, local people’s money is not necessarily from the local market. (See Figure 3-7) Understanding these aspects is important especially since they set designers or non-designers free from taken-for-granted assumptions and makes them find new combinations of materials and skills in their own perspectives and creativeness. Thus, it is easier for designers
and non-designers to look further than the previous approaches and seek alternative ways to design.

The whole product design process, consists of five steps; Selection, Ideation, Prototyping, Manufacturing, and Business (See Figure 4-5). So this chapter starts from a situation analysis in depth by concentrating on issues such as how the material can be selected for the target products, what kinds of skills can be optimized for the products and, finally, how the prototypes are developed. The entire process aims at merging the local culture into physical products under the rule of the grand theme learning by doing.

5.1 Situation Analysis

In this thesis research, an approach was applied that keeps in mind that “design studies underscore, among other considerations, the importance of social and cultural factors as a basis for analyses” (Korvenmaa, 2009). Accordingly, the first step of the design process is the situation analysis. In this stage, one must search for the core problem with the holistic designer’s view, which involves examining practical local contexts with its social and cultural factors. The field research of this thesis study uses personal experiences from the local culture as the starting point to define the local problems.
5.1.1 Everyday products
– cheap low quality products and recycling business

As briefly described in chapter 4, there are three main types of products in the target area, Kampala.

1. The first type is products that are low quality and cheap everyday consumer goods, such as spoons and forks, imported from abroad. The products of this type have a short lifecycle and many products are thrown away after being used for a short period of time. This causes serious disposal problems in the society.

2. The second product type is the handcraft goods processed by local skills. Picture 2 shows example products of this second category. The handcraft products are very important, because the products reflect the local culture, even when the culture is suffering from specific problems. For instance, the oil lamp in Picture 2 is a solution for the lack of electricity during sudden electricity blackouts, which are very common in Uganda. Due to these reasons, handcraft products have to be preserved, since they carry cultural values within them. However, the second category of products is made by less productive labor with simple skills. That is, the handcraft process consumes lots of hours, while the salary is extremely low and not sufficient with regard to the time that it
took to produce the handcraft product.

3. The third product type is a recycled product imported from abroad and fixed with simple skills such as a sewing machine. This category has a huge business power in the local market. For example, as in Pictures 3 and 4, the green shop is selling abandoned clothes imported from the developed countries. The green shop (picture 4) is cleaning and fixing the used clothes and then reselling the clothes to local customers, mostly for poor people. Many recycling small business like Picture 3 can be seen easily in the local market. However, even this recycled business has severe ethical problems in the system as such. Namely, local people actually prefer the low quality new products instead of purchasing the recycled ones. Therefore, one can say that local needs are not different from global needs, when the local people also hope to live in a modern world and buy things as new and, unused.
5.1.2 Mobility – Housing, Transportation, Telecommunications and Internet

Due to political stability, East Africa, especially Uganda, is growing fast economically. Accordingly, in Kampala there are many new business models based on foreign funding and investments from China and India, and many urban systems are constructed with the help of foreign investments. However, these investments are centered only on specific areas of the city center and directed to the profitable business sectors such as real estate and construction. In the case of public transportation, the system is still relatively undeveloped and its primitiveness causes not only logistic problems, but also contaminates the air by heavy pollution when environmental regulation concerning the transportation is weak or non-existent.

When it comes to telecommunications and ICT businesses, foreign conglomerates manage these sectors. The services are expensive and complicated to use compared to the local cost of living conditions. This means the development and investment are not balanced to improve the local quality of life. For example, the roads are paved based on foreign funding for the fast delivering logistics. However, the maintenance of the road is not managed efficiently or continuously, and thus there are annually many car accidents and the death rate remains high. Pictures 5 and 6 aim at giving an idea about the infrastructure in the city center of Kampala, Uganda.
5.1.3 Health – Water, Hospitals and Pharmacies

Water systems are possibly the most problematic aspect of local life. In the case of Africa, in general, people might believe that the water problem is based on the lack of water. However, this is not true. In turn, the water problem is based on the lack of water supply systems. Currently, the insufficient water supply infrastructure not only causes serious diseases, but also hinders education level of children, especially in the countryside, where children must gather water from the nearest water supply (which is not usually very near). Accordingly, many NGO programs have supported projects solving health problems, such as the building of hospitals, supplying medicines as well as to improving the condition and quality of water. However, their solutions are currently covering only small areas and thus they do not reach the starting points of these problems.

5.1.4 Education – University and Vocational school

In Kampala, there are two main universities that teach art and design; Makerere University and Kyambogo University. The subjects of art and design are mostly based on painting, sculpture and craft, which are very basic forming processes from the viewpoint of design. Picture 7 demonstrates the taught subjects at the university level. In Uganda, the education of the graphic process is concerned
with the design process. Society, art and design processes are not divided from each other and are considered as synonyms. For instance, design is an optional subject under the art department.

Naturally, in the domain where the economic system is based on agriculture, the design might not be seen as a tool to support the local businesses. That is, industrial design has not entered the local economy until now. On the other hand, vocational schools are offering practical skills to students who are usually under 18 years old. Graphic design is one subject in the vocational school as a practical skill, including sign design by hand. In this project, the experience from the training is the key process to understand current local culture and knowledge. Picture 7 demonstrates the traditional weaving skill, which is taught at the local university. Picture 8 exemplifies local and traditional African products, while Picture 9 shows one of the local vocational wood studios founded by Japanese investors. Wood studio, steel works, plumbing, electricity and computer skills are popular subjects in this local vocational school. Moreover, when the students graduate from the school or complete a course from the either institution, they become local workers and may establish small-sized businesses of their own. That is why these two types of design education institutions have a very essential role in the local design.

5.1.5 Organizations and communities – NGOs and governmental agencies

In the case of this target local area, the role of NGOs and local communities are essential. Many parts of the local economy are connected and supported by NGO programs. Due to this, NGOs and governmental agencies are strongly affecting the lives of locals in Kampala. In Picture 10, Makerere Women’s Community is taking care of children and training the local women to empower them economically. Mostly, the training consists of handcraft skills or teaching simple sewing machine skills. In Picture 11, one may see one of the workers of this community.
5.1.6 Local artists

Local artist studios are the examples of local SME designers in Uganda. Mostly, the size of their business is micro-scale, which means that they employ less than five people. Also, the local artists’ community is playing an active role in the local area, such as their work creating art projects for poor children in a slum. However, based on interviewing the local artists, the most difficult thing for them to do is to find proper materials and to form processes, because of the lack of money and technology. For this reason, many artists are using the recycling material like plastic bottle caps, plastic bottles and abandoned trash. These materials are easy to handle, but the output is not like the output of designed products and thus these works of local artists have less market power to make profit.
5.1.7 Economy – Market, Artisans and Workers

The central market in the target local area in Kampala is a sort of hub of material and money flow. In the market, all kinds of materials are flowing in and out to the smaller markets. That is, workers are supplying different types of materials through the market. However, the market has only a functional role of exchanging the goods to money, not having a developed service system like logistics or stocking services. Picture 13 shows how a small-scale entrepreneur artisan working as a carpenter does small-scale business in many local areas. This market structure represents well, how the economy is currently based on a simple product-exchange form.
Local carpenters, steel workers and sewing machine workers to name a few, are small businesses with local production using relatively simple hand skills learnt from experience or trained in an institution like a vocation school. These local producers produce many of the local products. However, there are some difficulties related when it comes to local technicians. Namely, in the small local market, there are many workers making exactly the same type of products and the production costs are relatively high for the workers due to old tools and inefficient production methods. As a result, they have to sell their handmade products with a higher price compared to imported products manufactured by industrialized large-scale production lines. This means that local people prefer to buy the cheaper imported products. However, despite the limitations of local small production businesses, through proper design processes and systems, it is possible to make these businesses profitable. Picture 14 describes a local worker, who produces tire sandals from recycled car tires.

*Picture 14/ A tire sandal maker in the Kiseka market, Uganda*
5.2 Product scope and social problems

As described in chapter 3, the biggest benefits of local products are their flexibility to adapt to new conditions, their ability to empower the local economy, to satisfy local needs and to preserve cultural heritage for diversity. In fact, active socially responsible design of local design is a strong benefit of local products compared to a monoculture global approach (Walker 2010). When it comes to selecting the product scope, the next stage is to choose and define those social problems, to which the local design aims at finding a solution. Hence, the main social issues are now selected for my design process based on the experience of local culture, living conditions, urban infrastructure and art and design contacts.

5.2.1 Water problem

The water problem of East Africa is discussed and analyzed in various international reports\(^2\), by several NGOs and is the target of numerous university product development projects to change social problems. Based on the cumulated experience from the local conditions in Kampala, the water problem is also the main factor posing a serious threat to human health in the society. However, in contrast with the general belief, the water problem in Uganda does not originate from the lack of water quantity, but in turn it has its roots in the lack of water supply infrastructure, distribution system and maintenance. As a result, local children are the major victims of dirty water and the lack of a water supply in Uganda. Hence, there is actually a tremendous need for sustainable local product design to tackle the water problem and thus improve the social conditions with local products. This means that at the end of the day, SLPD can actually be seen to take social responsibility to improve the lives of children in particular. Already, there have been many local product development projects focusing on these issues and aiming to

\(^2\) Detail information and statics of Water problems can be searched in the report from UNDP<br>on line available at: http://hdr.undp.org/en/reports/global
The water problem affecting particularly children in the society
improve the immediate physical problems related to water, which local people are facing today. These projects have, however, focused on solving the long-term problems with short-term solutions by helping people to survive on a day-to-day basis. More long-term plans and solutions are thus necessary. This is the big challenge of the SLPD process with a systemic approach. Picture 15 illustrates the water problem in Kampala.

### 5.2.2 Education
In the case of elementary schooling, the poor conditions of the water supply have an effect on children’s education in Uganda including Kampala city, because the primary daily housework responsibilities for children’ involve fetching water from the nearest water well or source. This problem is a core problem that could be tackled by designing local products. Also, the education materials and tools in the schools are poor and not sufficient for all. From the perspective of sustainability, educating the children is the starting point for any development in society, not only due to ethics and human equality, but also to develop local conditions and bring up new generations with open minds for change. Actually, toys play a truly important part in children’s education in the developing countries, since when the resources and materials are scarce, children and adults around must find new ways to create stories with toys made by them. The outcomes may actually be very creative. Picture 16 demonstrates the local materials recycled and redesigned as toys for local children, while Picture 17 shows a lecture in an elementary school in Kiboga, a countryside region of Uganda.

### 5.2.3 Transportation
The social problems described above are related to hygienic and educational issues. In addition, there is also a severe need for improvement of transportation networks and infrastructure. Due to the lack of public transportation facilities, an alternative system consisting of private bike transporters and taxies has developed in the target area. These private bike transporters are working in
unsafe conditions and also risking the passengers’ safety, since no driver is wearing a safety helmet. However, this is not due to the cost of the helmet, but due to high temperature and uncomfortable usability of the product. Also, there are no defined regulations to control the traffic as compared to Rwanda’s transportation legislation for instance. This social issue is imperative for the improvement of urban life, even though the nature of the transportation problem is different from hygienic and educational problems. This means that it is more complicated to design local products, because there are many unknown situations that must be considered during the design process. Still, this issue is worth solving with sustainable local product design through a proper system, which involves local stakeholders.
5.3 Material research

5.3.1 Local material

In agriculture, natural raw material such as bio-degradable materials can be seen everywhere. Picture 18 shows a toy made from banana leaves, which in Kampala city are often used as a good resource to develop local products. Curiously, in the process of forming the product, local cultural values are embedded into the product. That is, an organic material processed through a local skill offers local children a new inspiring toy without use of electricity during the manufacturing process. The main design concept of SMEs and NGO projects has often been this kind of improvement of handcraft skill customized to the Western market’s taste. Accordingly, many success cases can be seen in
the local market\textsuperscript{3}. From the viewpoint of business, this bio local material use in design has certain opportunities for local and global SMEs. However, from the point of view of development and maintenance of the local heritage, the unknown origins of the design as well as numerous products with exactly the same design are cause for suspicion. For this reason, a creative and unique design approach is necessary. For example, the basis for new, unique designs using local material, which is renewable material or recycling material, could be in choosing new ways for the manufacturing process as well as choosing different shapes and functions.

5.3.2 Symbol of water conditions
Following the assumption of SLPD that local material is not necessarily eco-material, designers willing to become sustainable product designers are currently feeling lots of stress when it comes to using the eco material. That is, they may stick to the idea that sustainable local design can only be sustainable when using eco material, even though it would be transferred from long distances or its origin was not known. However, as noted in chapter 3, from the viewpoint of this thesis research, the most important aspect of SLPD is to maintain the design in a long term. This means studying external solutions to expand the product’s lifecycle with a product service system (PSS). Thereby, searching for the material that contains or carries cultural symbols, but which is not necessarily biomaterial is the priority of the SLPD process. Due to this priority, the jerrycan, a plastic water canister, has been selected as the core material of this SLPD design process. The findings of the field research support the idea that jerrycan symbolizes the water problem of Uganda. At the same time, it symbolizes the related social problems such as educational and transportation problems. On top of this, it accentuates the weak role of children in the society, who have the responsibility to carry the water in plastic jerrycans throughout the year.

As a material and product, jerrycan has a long history behind it. It was initially

\textsuperscript{3} “Azizi life” is a good case of craft driven business in Muhanga Rwanda. [online available] at: http://www.azizilife.com/
designed by German military forces, but later it spread to colonized countries\textsuperscript{4}. The jerrycan’s advantage is that it is usually used, reused and recycled. This reuse and recycling are possible because of the flexible material characteristic of the jerrycan. Hence, it has many possibilities when it comes to designing new products from recycled plastic. Based on findings from this field research, there are four key characteristics, which make jerrycan a potential material for the SLPD design process:

1) Local production – Water canisters are essential products in Uganda. In Kampala city, a couple of plastic forming companies are supplying low cost jerrycans. The average product life cycle is around 6 months. The price of a water canister is 3500 UGX (10 Liter 1$), 6000 UGX (20 Liter less than 2 $)

2) Emotional attachment – Jerry can, water canister used widely in everyday life to all generations. Even the feeling to jerrycan might not pleasant but many local experiences are connected with this water canister.

3) Easy to handle – Jerry can is a flexible thin plastic. It can be cut by simple \hspace{1cm} \\

4. There is no detail information where jerrycan is from and how it can be used. There is general information of the history of jerrycan from Wikipedia<http://en.wikipedia.org/wiki/Jerrycan>
tools like a cutter and scissors.

4) Stronger than biomaterial – This material is synthetic multi-fiber produced from petrol (Polypropylene : PP). This artificial synthetic fiber is more complex and stronger than natural fiber.

5) Reusability and recycling ability – The easy-to-use character of jerrycan makes it easy to reuse for other purposes.

5.4 Ideation for local product concept development

After the situation analysis, the ideation and concept development of the local product design come second. Here we use the alternative SLPD design process (see chapter 3.3.1). That is, after researching and defining the social problems, it is possible to make connections between local product and social values of the local target area. In the stage of ideation, the type of the products as well as the target users of these products are defined. In this stage of ideation, three different concept types were chosen based on the target user niche. The three concepts are a user-driven product concept, a market power product concept and a social-driven product concept.

5.4.1 User-driven product concept

In Kampala, the main industry is agriculture, while manufacturing and other industrial sectors are relatively undeveloped. Accordingly, industrially manufactured products are mostly imported from abroad. However, those daily products, which have the highest local demand, are produced locally in Uganda. For instance, the need for plastic water tanks is very high due to the current poor water systems in the country. After the first round use, the empty tanks cause a logistics problem. When it comes to smaller scale user-driven everyday goods, they are produced by small size local workers or recycled from
the first round used leftover products. These local products produced by small-sized businesses are highly expensive to buy, because it takes a long time to finish one product by manual processes. At the same time, these small-scale businesses do not allow recycled concepts in the same market due to product quality image.

In the design process, however, the main point is to design products of reasonable price with simplified new process by using proper material. The reasons why jerrycan was chosen as the target material of tire sandal design process are the controllability of the plastic material as well as the excessiveness of empty jerrycans waiting to be destroyed. Hence, the main challenge in this stage is to design a process, in which the plastic material is easier to exploit and use in several applications. Also, an important point when developing the design concept is that the users vary depending on the product produced from the recycled jerrycan.

5.4.2 Market power product concept

One of the difficulties related to local products is that it is very difficult to make profit in the small local market of Kampala. In Uganda, the distribution of wealth and income among the society is unbalanced and the elite with high purchasing power are only a small fragment of the total population, while the major part of population is poor with median monthly income of approximately 322.12$ (2012 present) and GDP average 965.33 US$. As a result, the SLPD design strategy for scaling up globally is strongly necessary. Namely, it is currently hard to find unique local designs, since local designers are educated in local institutions, which have less experience of design processes than is offered through the research of art and design university education system. Thus, many products, which are produced in the local products, are craft-driven with similar production processes and similar styles. Naturally, it is a challenge to design products from the local culture, which at the same time have global consumer tastes’ integrated into the products.

5. UGANAN GDP per capita: (averages for the period from 2000 to 2010) 965.33 $ (USA441624.92$, India 2345.86$) statics are from http://www.theglobaleconomy.com/ and <http://www.numbeo.com/cost-of-living/country_result.jsp?country=Uganda>
5.4.3 Social-driven products concept

The third product concept category aims at improving the quality of local life through the design process. Design is a kind of hybrid process that considers many factors at the same time. Especially the SLPD process can be seen as a holistic approach not only due to the design process as such but also due to the systemic service around the product. For example, in the case of Kampala’s public transportation, to improve the safety of motorcycle taxi drivers and the users of these motorcycle taxis one must connect the relevant stakeholders, like decision makers, manufacturers and companies selling the products to name only a few. This is the imperative of sustainable local product design process. In this BEAM project, safety products such as safety helmet and safety vest are the product concepts aiming at solving the dangerous conditions of the motorbike taxi drivers and customers through the sustainable local product design. Figure 4-6 is representing four different types of products made from jerrycan water canisters during the BEAM project:

<table>
<thead>
<tr>
<th>Product name</th>
<th>Jerrybag 80% Prototype</th>
<th>Safety product 15% Prototype</th>
<th>Toys and education tools Ideation</th>
<th>Tire sandal 40% Prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product type</td>
<td>Bag pack</td>
<td>Wearable products</td>
<td>Toys for kids or Education tools</td>
<td>Sandal</td>
</tr>
<tr>
<td>Skills</td>
<td>Sewing machine</td>
<td>Sewing machine</td>
<td>Melting hand skills</td>
<td>Melting Hand skill</td>
</tr>
<tr>
<td></td>
<td>Stitching hand skill</td>
<td>Stitching hand skill</td>
<td>Stitching hand skill</td>
<td></td>
</tr>
<tr>
<td>Target Users</td>
<td>Local &amp; Global consumers</td>
<td>Local motorcycle drivers &amp; users</td>
<td>Kindergarten &amp; Elementary Students</td>
<td>Kids</td>
</tr>
<tr>
<td>Product target</td>
<td>Market driven products</td>
<td>Social needs</td>
<td>User needs</td>
<td>User needs</td>
</tr>
<tr>
<td>Social Issues</td>
<td>Water issue</td>
<td>Public transportation</td>
<td>Education</td>
<td>Public Health Education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Public safety</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4-6. The four product types made from Jerrycan water canister
Figure 4-6 is presenting the product cycle which is started from Jerrybag to tires sandal. Each product has its own target social issue and consumers. During recycling and reusing processes, different cultural and social values and stakeholders are involved at the design process.

5.5 Prototyping in a local context

5.5.1 Local skills

In a less industrialized economy like Uganda, there are fewer choices for designers. Nor are there the proper skills for handling the thin plastic of a jerrycan in the local area. As a result, the best solution for the creative new approaches of SLPD is to optimize the local skill with the aim of design. The vocational schools in Kampala are teaching practical skills to students by training them at several courses. Such proper hand skills for managing the thin plastic could be found in the leather-work class in Kyebando vocational training center. By using the skills learned in the vocational school, the prototyping of the target products develops these skills to the sufficient level to reach satisfactory outcomes. The key skills to produce the target products are sewing.
skills with the sewing machine, melting skills and leather stitching skills. Below the list describes these skills in detail:

1. **Sewing machine** / Sewing machine skill is one of the basic skills needed for living in the local market. This skill is used for many types of products.

2. **Melting** / It is a simple technique in which the edge of plastic is melted and then pressed. After that the surface of the edge is expanded from heating to support the part of a tire sandal. This skill of melting the edge is very easy to learn and do in a reality. This skill can be applied to the tire sandal making process.

3. **Leather Stitching** / This skill is useful and practical and can be used for production of local products other than the target products of the BEAM project described here. The skill connects the soft part of leather and the hard rubber parts by stitching them together one by one. In this research, the stitching skill was optimized through a repetition of producing six prototypes of Jerrybag. The skill needs some hours to reach the desired outcome, but it is easy to learn and to be applied to other products. Picture 21 shows the cutting skill of a teacher from a leather-work class in Kyebando vocational school.

### 5.5.2 Local workers

Many different types of local workers can be seen at the local markets. Picture 22: Sewing machine worker in Nakasero market.
22 shows one of a sewing machine professional worker in Nakasero local market. They have professional skills for their living. Normally they work together as a group in the working space and share profit after the products are sold. The other type is private workers such as the independent carpenter from Picture 14 or workers belonging to social associations as shown in Picture 26. Professional workers are good at working together when the design is finished and is ready for them to order. On the other hand, independent workers have advantages when the design is still on the prototype condition. In the case of Kampala city, there was no explicit rule of labor. It was one of the challenges to find proper labor at a reasonable cost.

5.6 Target products

5.6.1 Jerrybag / Market driven concept

a. Idea sketch- The Jerrybag is used carrying and keeping the laptop safe in
the protection bag. It is based on the characteristic of the middle hardness and box shape of jerrycan water tank. Sketch 5-1 is one of final sketches of the Jerrybag. The shape is designed not only for the local market but also for general, international consumers for scaling up to the global market. As shown in Picture 23, the whole process was discussed with local artists and people together. Picture 24 shows the sixth prototype of the Jerrybag based on the idea sketch.

b. Material and combination- Sketch 5-2 shows mateiral and skills all the combination of Jerrybag design. The local African pattern (No. 5 of the image) is used inside and outside the bag, to support the material strength and African identity.

c. Applying the skills- The prototypes were processed six times at the vocational school, Nakasero market and Makerere Women’s Community (see Picture 26). The design was improved for the better conditions and based on the workers’ own ideas and suggestions. The leather stitching skill was optimized by using double tied knob stitching.
The sixth prototype of the Jerrybag.

**Sketch 5-2. Material combination of the Jerrybag**

1. **Jerrycan**
   - Cutting
   - Market
   - Community
   - Technician

2. **Fabric**
   - Stitching
   - Market
   - Community
   - Technician

3. **Pattern**
   - Glue
   - Artists
   - Community
   - Technician

4. **Strings**
   - Sewing
   - Community
   - Technician

5. **Stitching**
   - Sewing
   - Community
   - Technician

**Picture 5-1. The sixth prototype of the Jerrybag**
5.6.2 Tire sandal / Local needs based concept

a. **Ideation**- In the local market, tons of plastic sandals were imported from foreign countries, since it is one of the low quality, cheap products needed in everyday life. Currently, many people are buying tiresandals because of the very low price, not the product as such. The new tiresandal design was developed in this master’s thesis research, however, it has some problems regarding its comfortable use. In the first design, nails are used for connecting the string and the sole, but the sandals were uncomfortable. The new design uses jerrycan material and the melting technique to join and keep the parts together. This method avoids and eliminates the use of nails completely and as a result the sandals are comfortable. (See Sketch 5-3) The design is safer than before because no nails are used, and the jerrycan part can be obtained

![Sketch 5-3. Tire sandal sketch](image)
everywhere easily and the melting skill is simple to learn and apply. However, the design should be further developed in providing better usability.

**b. Material and combination**- Flatting soles are supplied from tire sandal workers and the strings are from recycled jerrycan. Melting skill can support the bottom and make the string strong. However, the skill is melting small part of polypropylene from a jerrycan. It emits toxic fume from melting synthetic plastic. For the reason, even the fume is small but sound solution should be considered in the future.

5.6.3 Safe products / Improving social conditions

**a. Ideation**- The safety helmet is still at an ideation level. The design is planned to be designed with local designers and bike users. The design factors are cooler, lighter and safer than previous products, and sell at a reasonable price and can be produced in the local target area. The other business model for spreading the products is suggested at chapter 6 as a sustasinable strategy.

**b. Material and combination**- Picture 32 shows one example of safety helmet made from part of a jerrycan. The design of safety products is on the process with local stakeholders.
5.7 Conclusion of the product development

This case study in Kampala had its purpose of developing sustainable local products with the material that has cultural and social meanings and symbols in it (see chapter 3). The target products were planned as four different types during the field research period. The process was based on product development. In the process, the most important part was to identify the target social problems like the water issue and education issue. After identifying these problems, jerrycan water tank was decided upon as the symbol of these problems and a solution, since it carries a local story embedded in the material. The skill for controlling the plastic parts was developed by cooperating with the local people during prototyping of the products. Figure 5-7 compiles the results obtained in this product development process of the BEAM project. The table shows various product information, such as life-cycle connections from Jerrybag to tire sandal. However, the main point of the SLPD is not only to design local contents products. In addition, these local products should carry a long-term plan. One of the long product plans can be a systemic approach in which all stakeholders are connected and positioned in one map. The other sustainable strategies to be developed in the future should thus aim at supporting the long-term product plan for SLPD as a sustainable strategy as seen in chapter 6.
<table>
<thead>
<tr>
<th>Product name</th>
<th>Jerrybag</th>
<th>Safety product</th>
<th>Toys and Education tools</th>
<th>Tire sandal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st cycle</td>
<td>2nd cycle</td>
<td>2nd cycle</td>
<td>2nd cycle</td>
<td></td>
</tr>
<tr>
<td>Life cycle (Estimations)</td>
<td>Re</td>
<td>Re</td>
<td>Re</td>
<td></td>
</tr>
<tr>
<td>50% x2 3 years</td>
<td>50% 7 years</td>
<td>more than 25%</td>
<td>less than 25% 3 months</td>
<td></td>
</tr>
<tr>
<td>Product type</td>
<td>Back pack</td>
<td>Wearable products</td>
<td>Toys for kids or Education materials</td>
<td>Sandal</td>
</tr>
<tr>
<td>Material</td>
<td>Jerrycan (Polypropylene) Imported PVC fabric Africa cotton fabric</td>
<td>Jerrycan (Polypropylene) Searching the material</td>
<td>Jerrycan (Polypropylene) Searching the material</td>
<td>Jerrycan (Polypropylene) Recycled tire</td>
</tr>
<tr>
<td>Skills</td>
<td>Sewing machine Stitching hand skill</td>
<td>Sewing machine Stitching hand skill</td>
<td>Melting hand skills Stitching hand skill</td>
<td>Melting Hand skill</td>
</tr>
<tr>
<td>Target Users</td>
<td>Local &amp; Global consumers</td>
<td>Local motorcycle driviers &amp; users</td>
<td>Kindergarten &amp; Elementary Students</td>
<td>Kids</td>
</tr>
<tr>
<td>Cultural values</td>
<td>Social issue Local labor Local material Local skill Local art pattern</td>
<td>Social issue Local labor Local material Local skill Codesign Local art pattern</td>
<td>Social issue Local labor Local material Local skill Codesign</td>
<td>Social issue Local labor Local material Local skill Codesign</td>
</tr>
<tr>
<td>Product target</td>
<td>Market driven products</td>
<td>Social needs</td>
<td>User needs</td>
<td>User needs</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Local &amp; global market Local manufacture</td>
<td>Big company Government Local manufacture</td>
<td>NGO Local manufacture Design University Local artists</td>
<td>NGO Local manufacture Design University Local artists</td>
</tr>
<tr>
<td>Service</td>
<td>Local Brand Investment for water Reuse</td>
<td>Commercial Spread Free advertising Regulations</td>
<td>Non-comercial use Investment for Education</td>
<td>Non-comercial use Investment for Kids</td>
</tr>
<tr>
<td>Social Issues</td>
<td>Water issue</td>
<td>Public transportation Public safety</td>
<td>Education</td>
<td>Public Health Education</td>
</tr>
</tbody>
</table>

Figure 5-7 product table from Jerrycan
Picture 26/ The second prototype
Jerrybag blue
Currently, the large multinational companies and international organizations like NGOs have taken the lead in the strategies of DFS (Design For Sustainability) by stimulating strongly the regulation, competition as well as interests of various societal stakeholders of sustainable development. By contrast, the small SMEs generally lack sufficient staff, time and funding to lead their business towards sustainable solutions (Carlien 2001).

As noted by Walker, one of solutions for local design is a system that integrates mass-production with complementary local production and services (Walker 2010). Moreover, designing products and services, whether tangible and intangible (Hollins 2005), has a benefit in that when they work together to satisfy the customer, they do not produce rebound effects\(^1\) that erode the potential environmental and social benefits or the economical attractiveness.

\(^1\) The rebound effect is generally expressed as a ratio of the lost benefit compared to the expected environmental benefit when holding consumption constant. Grubb, M.J. (1990), “Energy efficiency and economic fallacies.”, Energy Policy
Also Manzini and Vezzoli suggest a Product Service System (PSS) as an alternative approach, since PSS moves the business focus away from producing and selling physical products to offering systems of services and products to satisfy the user needs in innovative ways (Mansini and Vessoli 2003). Actually, the emphasis of such a product-service system is on product maintenance and upgrading at the local level as well as on contributing to environmental and social issues. This differs in emphasis from conventional definitions of product-service systems, which focus on fulfilling user needs via marketable product-service combinations (Morelli 2003).

In this chapter, a practical PSS system map is applied to the prototypes of the field research and suggested as one of sustainable strategies of SLPD. Also, two more practical solutions will be discussed and applied to the prototypes, which were designed during the field research. The aim of building such a strategy by applying a PSS system map is to create local values from SLPD and, in particular, creating social attachments to the local brand. In addition, a simplified assessment tool is introduced at the end of this chapter with a purpose of evaluating the SLPD in terms of systems processes, social values and design values from the point of view of customers.

### 6.1 Pragmatic Product-Service System (PSS)

Normann pointed out that eco-efficient system innovation derives from a new convergence of interest between the different stakeholders: innovation not only at a product (or semi-finished) level, but above all as new forms of interaction/partnership between different stakeholders, belonging to a particular value chain, or value constellation (Normann 1995). Below Figure 6-1 demonstrates a service interaction module based on the interaction and partnership between the system stakeholders. Figure 6-1 follows the idea that a product service is formed from the stakeholder relationship and business strategy (creating values) (Normann 1995).
6.1.1 Interaction and Partnership

Figure 6-2 is a stakeholder map of the BEAM field research project. The stakeholders in the map can be divided into four different categories; Community, Market, Education and Association. The names on the map are real international stakeholders who can act actively in a long term. Community stakeholders are small social groups based on specific aims such as Christian groups and students unions. Stakeholders in the Market are normally material providers and local professional workers. Education institutions are mainly local university such as Kyambogo University and vocational schools. The last Stakeholders are at the association level, which includes social institutions such as Makerere women’s development and NGOs. Active and passive reactions of each stakeholder can be recognized by the color. Red color stakeholders can work actively in the system and the green color stands for not dynamic but expectable stakeholders in the system. Members of the gray color group are not expected to work in the system. This stakeholder map can be a useful tool before designing the service system, because it presents possible real conditions and potential of the systems before it is up and running, and
Figure 6-2. Stakeholder map of the BEAM project showing current connection in reality (Joong yeol 2012)
provides an indication of what can really be designed in reality. Based on this stakeholder map describing the real life conditions and potential connections, a service system can be designed to create values between people, technology and, organizations and share information between providers and customers.

6.1.2 System map

Figure 6-3 shows three PSS systems customized to the prototypes of the BEAM field research; Jerrybag, tire sandal and safety products. Each service is planned according to the service interaction module (see above Figure 6-1 and Figure 6-2), which is formed by networking the current connections of stakeholder interactions and the value creation structure. Each system has a different stakeholder relationship because of the different product type. The services consist of practical information for collecting the material, the service of product design and the service to tool social operations. These system approaches are based on the MEPSS (Method for Product-Service System development).

1) Service with the Jerrybag- The product service is aiming at extending the life cycle of jerrycan by reusing the abandoned jerrycan parts. Moreover by reusing the material, the products can work for solving local problems. The specific service of Jerrybag is starting from collecting the material from a local market and local users, who possess old material, which they do not to use or need anymore. Even though the service is a sort of reuse process, new jerrycans purchased from local markets have to be considered as a material supply due to the risk of insufficient jerrycan supply in regard to recycled material. This means Jerrybag can be made from used old jerrycans, which would be abandoned, or purchase new jerrycan from the local market. The SME, which

2. (Stakeholder) System Map is a Sustainability design orienting toolkit (SDO) from the book System design for sustainability “Theory, methods and tools for a sustainable “satisfaction-system” design Carlo Vezzoli 2007 Page 199-242

3. The MEPSS innovation methodology and tools assist your organization in creating new product-service offerings. In this research, PSS system map is adapted from one of MEPSS processes. <http://www.mepss.nl>
is explained as a design studio in the map, is the central actor of this service by recollecting, designing the products, manufacturing with local people and doing business locally and globally. At the same time, by cooperating between other SMEs and the NGO, Child Fund\(^4\), the business can support improving the social problem in the target area, which has severe water issues. For instance, in this research, some of prototypes of Jerrybag were sold to customers who wanted to buy the Jerrybag, from which 5% of profits were donated to Child Fund’s water project for kids living in rural areas\(^5\) with poor water conditions.

2) **Service with tire sandal**- This product and service bring together the skills already available locally through the tire sandal maker in Kiseka local market and introduce a new skill, which involves plastic melting instead of using nails in the tire sandal, to the SMEs. Therefore, the social operation tool service is the main service in that it allows for cooperation with local workers and spreads their products through the proper organizations. For example, the expected lifespan of one tire sandal is less than 3 months, but the new skill of the tire sandal may extend the product’s lifespan when local workers apply the plastic melting technique. In fact, this type of product is currently less profitable in the market. For this reason, the products can be used to support bare feet kids in rural areas through cooperation with relevant NGO projects.

3) **Service with safety products**- This service improves social conditions, but it is not based on direct customer needs. This aspect makes the system more difficult, because it creates needs and motivations to move among the stakeholders. The main motivation and reason for this service is to satisfy each stakeholder’s need. That is, companies need advertising methods for their services and products as well as good corporate image in order to be referred to as a socially responsible entrepreneur. Government, in turn, desires public

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\(^4\) Child Fund is an organization based in USA helping children in less developed countries in terms of water problems. <http://www.childfund.org>

\(^5\) The first money was donated at Gulu district in Uganda for cleaning water pumps in the primary school.
safety. The motorbike taxi drivers and users by contrast wish to have free equipment for keeping them safe. The service is thus connecting the needs with the products. The product itself can be used as an advertisement tool for the companies that want to increase their visibility and advertise with widespread marketers (compare to bus transportation advertising). In this service, the company pays for the product instead of drivers and the bike customers as compensation for their advertisement. The government can make the regulations to force passengers and drivers of motorbike taxis to wear safety products such as helmets or neon yellow safety vests (one of the ideas for safe products). The SMEs, in turn, can offer the service of product design by cooperating with local design institutions that want to share the experience of design process for social problems. Figure 6-4 represents the three services as a whole and as integrated into one. The lifecycle of one jerrycan can be thus extended and the social values can be integrated into PSS from step-to-step in this system.
6.2 Creating local values

When it comes to creating local values, they are not only applied during the local design process (see chapter 3), but more importantly in the strategy of SLPD, the creation of the local values is the key method for maintaining the products and extending their lifecycle. In this stage, the core question is how to create real economic values from locally manufactured products. From the
Journey of Jerrycan

BEAM project
PSS (Product Service System) in Kampala city
based on Carlo Vezzoli 2007 system design tool

Figure 6-4. Entire PSS MAP of BEAM project
viewpoint of this master’s thesis research, there are three suggestions to SMEs to generate local values; local brand, social value connection and scaling up to the global level.

1. In terms of this first suggestion, **the local brand**, John Hesitt, a senior designer at Moving Brands, notes that in recent years, customers increasingly see sustainability as, “part of their responsibility as good corporate citizens.” Where branding is concerned, there has definitely been a visible change. This means that they have matured from simply ‘giving a nod’ to greener practices towards building their brands around them. So, by manufacturing products in a sustainable manner, SMEs can have access to eco-labels, which in turn can open new market opportunities (Masera 2001). Figure 6-5 is an example of a local brand created during the field research. In this case, it can be helpful for smaller local manufactures to represent themselves and make their specified roles explicit, when local identities are expressed in their logo and tags. This local brand is only an example created during this research study and thus its role is only to clarify, how local branding can be used as a strategy of sustainable local product design. However, this should be studied more in depth as a sustainable strategy in the future research and therefore it is not detailed more in this thesis.

![Figure 6-5. Example of local logo expressing the BEAM project](Logo design by Jarkko Kurronen 2012)
2. As far as the second suggestion for the strategy of SLPD is concerned, the social value connection is a possible option. That is, in the process of local product design, creating local values can be possible through social responsibility. Accordingly, each target product of the field research has its own connection with social issues. To SMEs, the cultural context can be a challenge, but on the other hand it can be an opportunity not only in terms of a business model but also when it comes to social responsibility. (see chapter3) That is, in the case of Jerrybag, the social value connection refers to the problem of water, in the case of the tire sandal, it is related to improving local health conditions and in terms of toys designed from jerrycan, the social value connection is integrated through a reference to local education. Safety products, in turn, have the purpose of addressing the insecure condition of public transportation. Picture 27 is one example of posters of jerrybag. The image stands for integrating the local issues with products through a massage.

3. As far as the third suggestion for the strategy of SLPD is concerned, it refers to general knowledge of localization following the ‘site-here-to-sell-
here’ (Porritt 2007) approach. This approach means satisfying local needs through local manufacturing and local business. However, it is not a practical approach especially to local and international SMEs in the globalized world, since as Spangenberg mentions, an environmentally or socially friendly way of production can be part of a corporation’s identity and marketing strategy (Spangenberg 2001). This means that SLPD with cultural values, unique design approach and systems service have opportunities to scale up into the global market. For instance, the water issue is not the only issue of a specific area in less developed countries. This issue is a common problem worldwide, which has to be solved together. Picture 28 is presenting the international interest in the water issue with a message. In brief, to SMEs, the possibility of local products in the global market can be a strong motivation when they seek to be sustainable in their business and product design.

Picture 28. A poster of Jerrybag in South Korea
6.3 Simplified Assessment

In the DFS (Design For Sustainability), simple and efficient evaluation is one of big challenges in order to develop the design process. DFS is an eco-design concept that has evolved to include both the social and economic elements of production (Clark 2009). Actually, in the case of eco design, many international and small-scale criteria for assessing the design have been developed and applied from the 1990’s. The tools, however, have limitations in objectifying the boundaries to judge design and design process. This is a possible example of simple tools for the sake of assessing SLPD for SMEs designers and customers so that the field of DFS could develop as such. The tool is based on a method, which is marking the score as a result of the key words in each blanks filled in according to the customers’ perspective. In the end, each numerical value is summed up. The point of this tool is that it shows the median opinion of customers giving the numerical value for every key word. That is, the normal distribution shows, which key words are those that customers see similarly and which key words have high volatility among the answerers. The final value after summing up may be used as a sustainable score of the target product. Standard deviation formulas are used to objectify subjective perspectives of people. Companies can use the score to forecast their supply and production for their customers when the companies already know the opinion about the product among their target niche. Figure 6-6 is a sample of an assessment card. The evaluation process is based on three categories: Values, System and Design. This is an example of simple assessment tool based on customers’ participation. The simple assessment tool is one of the huge issues of DFS. However, this research is not the aim of studying the assessment tool, even though this subject is worthy of in depth study.

Values
Social values/ Cultural issues connection, Fair trade etc.
Eco-values/ Saving energy, Non-toxic material, less-water use etc.
Economical Values/ Profit, Reasonable price, Local business support etc.

**System**

Process/ Lively Interaction
Structure/ Long life, Self-evolving
Function/ Efficient, Effective

**Design**

Longevity/ Material, Structure, Joints etc.
Function/ Usability, Convenience etc.
Emotional attachment/ Aesthetic, Narrative etc.
Brand/ Preference, Locality etc.

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*Figure 6-6 An example of simple feedback suggestion*
CONCLUSION

The target audiences of this thesis are product designers, especially micro and small size entrepreneurs, since they are the backbone of a local economy. Hence, they will play an essential role in local sustainability. This is not only because they create local economic value, but also because SMEs participate in creating local cultural and environmental values. Accordingly, this master’s thesis started from defining the tremendous theme of sustainable development as a whole. Despite the many international efforts launched in the 1980’s to control unsustainable production and consumption behaviors, the macro level approaches are still unbalanced to promote sustainability. Thus, micro design approaches from designers and non-designers have to be planned and encouraged actively to seek balance with the macro level actions (Chapter 2). To make macro and micro level actions work together, one should see SLPD’s most innovative and creative components to actually understand and combine local issues and cultural values in the design process. Local material and skills, which are embedded with cultural values, can be some possible solutions of SLPD.
Uganda was chosen as a target of the field research not because of the poverty, but because of the possibilities, which the country possesses. (Chapter 4) During four months of field research, the stages of understanding the local culture, identifying proper materials, optimizing the skills suited for the material, contacting with active stakeholders and creating systemic engagement with the stakeholders were undertaken. (Chapter 5) In the end, prototypes (Jerrybag, tire sandal and safety products) could be designed based on these research stages in the local context.

7.1 Discussion of outcomes

7.1.1 Analysis of values
In the beginning of the ideation stage, four different types of products were connected with cultural issues based on the findings obtained during the field research. The core in the ideation stage was to create products, which could be used to solve the social problems. Also, these products were chosen to be designed since they carried cultural values in the material and skills needed to become produced and thus they could be considered worthy of spreading to manufacturing. Moreover, when it comes to eco-design, the whole system is a process of recycling and reusing, even though basic materials, synthesis fibers (PVC in Jerrybag) and chemical glues of the material were not obviously the most environmentally friendly material to be used. Actually, it was not clear where the materials were exactly from and thus this aspect could not be considered in the design process. In terms of the economic value, it is more complicated to evaluate the outcomes since one cannot exactly say, who can be a target user, how much the manufacturing costs, who are the distributors, what the business model is like when sold and what the revenue flow is after production and logistics costs. However, after the many interviews with local shops, NGOs, and international business managers, it became clear that if the price is more reasonable and the quality is improved further, the products, especially Jerrybag, have potential to succeed even in the global market.
7.1.2 Analysis of service system

A systemic approach in the sustainable design process is a new concept. In reality, this part is the hardest part to apply to the design process, especially in the case of the micro and small size designers and entrepreneurs. However, during the field research, systemic thinking was applied to SLPD. A stakeholder map (Figure 6-2) and service systemic map (Figure 6-4) were used as the main tools of this systemic approach. Each target product has different stakeholders, but in the end all products can be connected in the up-cycle and reusing process. All local and global stakeholders are real stakeholders working actively in the system. Nevertheless, the structure of the system is very complicated with different stakeholders, material flows, money flow and information flow in the map. Thereby, with the current limited information it is difficult to define, how well this system works in reality when integrated into the local concrete context. For this reason, the period of implementation should be planned and executed in the future.

7.1.3 Analysis of Design

Design processes can also be evaluated based on various criteria for efficiency. However, design is the outcome of complex actions and thus it is difficult to give objective measurements or quantitative results of efficiency. According to the design history (Figure 2-1), the design process could be analyzed according to Function (1890’s), Emotion (1960’s), Semantic (1980’s) and Performance (2010’s) perspectives. However, these are never absolute standards. For example, from the point of view of aesthetics, local people and especially the Ugandans exhibited different reactions to the Jerrybag. This can be related to users’ emotional attachment to jerrycan. This research does not analyze further the reason for volatile reactions towards jerrycan among test users. So, only in the functional area, it can be said that the products, which are suggested from the field research, have strong functions for the target users.

Conclusion

For example, tire sandal has a function of protecting the bare feet of kids walking on poor roads in a rural area. In a holistic view, the design from SLPD can be said to give these products a connection to social and cultural values. Thus, these products can be expected to have local economic value in the local market and even in the global market.

7.2 Future steps

7.2.1 Challenges in the future for sustainability

Referring to a study of CEOs in the world’s leading companies in 2010, 93% of the CEOs believed that in 10 years sustainability issues will be critical to the future success of their businesses (UN GCA 2010). However, as James comments, it is still unclear what sustainability means, both because of a lack of data and because of social and cultural disagreement (James 1997). While the large companies have taken the lead and are strongly stimulated by regulation, competition and interest from various societal stakeholders, they claim that ‘smaller companies will follow naturally’ in their line of reasoning. It is true that it slowly became recognized that small and medium-sized enterprises (SMEs) need specific support (drawing from Carlien 2001). For well-balanced sustainable local product approaches, there are many challenges to successful outcomes.

Firstly, as Spangengerg utters, given the cost, time and capacity constraints that small and medium-sized entrepreneurs (SMEs) in particular are confronted with, simple but robust measures are needed (Spangengerg 1995). In other words, proper measurement systems are needed for micro design processes like the simple assessment tool, which is suggested in Chapter 6. Also, one of the confusions regarding sustainable product design is that people might think sustainable design refers to new design processes like furniture design, vehicle or mobile design. However, sustainable design is a sort of design strategy such as industrial or eco strategy that does not focus on the object itself. Therefore, simple evaluation tools can help SMEs to build their own sustainable design
and business strategies.

Secondly, more education is needed to offer better understanding about current sustainable practices. Masera stresses that SPD, as any new activity that implies a change in the current production patterns of SMEs, requires a process of understanding and training that needs to be initiated and promoted by organizations that are devoted to this purpose and that include professionals trained in the subject (Masera 2001). There are so many cultural differences and diverse social values in the world that make it difficult to understand gaps between theoretical and real sustainability. As a solution, we should firstly be aware of these gaps as well as the narrow-minded prejudices, which discourage diverse activities to promote real sustainability. Some authors blame cultural design activism, especially the trials of independent designers, by denouncing it as only an action of solo designers with the aim of gaining the attention of the public. Unfortunately, such an attitude is misleading, because it promotes hesitation towards small-scale actions and nominates micro level practices as unimportant. However, today we urgently need more dynamic activism than dynamic criticism. Sustainable innovations of design are not created always by the book, through long academic analysis of macro level problems, but they may be created by experiencing the macro level problem at the micro level. Also, by meeting the people, who are the victims of current systems and listening to them, designers may understand what is actually needed. This does not mean limiting the creativeness of designers, but systemizing their design as part of a bigger entity.

7.2.2 Realizations

Manzini and Vezzoli aptly describe a sustainable design strategy as an intended design activity aiming at an integrated system of products, services and communication, based on new forms of organization, based on the role reconfiguration of different companies, clients and other stakeholders; a design developing a strategy linking long term goals with existing trends and based on new systems of values and new market opportunities (Manzini and
One more very important thing is that as Chapman sees it, for a product to be ‘sustainable’, those factors that can directly or indirectly affect socio-economic equity and the natural environment must be carefully considered (Chapman 2005).

In conclusion, this thesis naturally might not be a perfect process to make people understand local sustainable product design approaches. However, as noted by Shedroff, *design is the problem: the future of design must be sustainable*, there is no perfect system, as long as you check your assumptions from time to time, keep educating yourself and others on the current state-of-the-art of both understanding and possibilities, and strive to do what you can, you’re on the right track (Shedroff 2008). This statement by Shedroff aptly summarizes the final finding of this thesis research about SLPD. At the same time, this study can also be seen as a starting point or as a new chapter for the realization period for the suggested strategies. Also, this research seeks to give inspiration to other designers and design students, who are willing to learn about sustainable design in practice and to learn by doing. For additional details and further information about the BEAM project, the reader is welcome to visit the website.

http://jyparkdesign.com/
Acronyms

DFE / Design For Environment
DFS / Design For Sustainability
ICT / Information and Communication Technology
LCA / Life Cycle Assessment
LIC/ Less Industrialized Countries
MEPSS/ Method Product Service Systems
MSMEs/ Micro, Small and Medium sized Enterprise
OECD/ Organization for Economic Cooperation and Development
OLPC/ One Laptop Per Children
PSS / Product Service Systems
SLPD/ Sustainable Local Product Design
SMEs/ Small and Medium sized Entrepreneur
SPD/ Sustainable Product Development
UNEP/ United Nations Environment Program
WBCSD/ World Business Council for Sustainable Development
WCED/ World Commission on Environment and Development

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Appendix


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