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# Design Thinking for Entrepreneurship in Frugal Contexts

Lisbeth Svengren Holm<sup>a\*</sup>, Maria Nyström Reuterswärd<sup>b</sup> and Godfrey Nyotumba<sup>c</sup>

<sup>a</sup> University of Gothenburg

<sup>b</sup> University of Gothenburg and Chalmers University of Technology

<sup>c</sup> Jaramogi Oginga University of Science and Technology (JOOUST)

\* Corresponding author e-mail: lisbeth.svengren.holm@gu.se

**Abstract:** Even if design is recognized as an important driver for innovation on a global scale, there are still many countries in the developing part of the world where design as a process for innovation do not play any significant role for businesses and society. There is however a growing interest in design as a resource for innovation in many developing countries, e.g. in Kenya, where these projects are taking place. The results illustrate how design can support a local network by establishing a co-creation process as the basis for innovations and entrepreneurship in a frugal context, the role and value of design thinking for supporting entrepreneurs. The experiences and learnings from frugal innovations are of equal importance as the process and mindset of Design Thinking. A new type of Knowledge Cluster therefore includes not only design knowledge and skills, but also frugal innovation and frugal criteria.

**Keywords:** Design Thinking, Frugal Innovation, Frugal Context, Knowledge Clusters

## 1. Introduction

The interest for using design, and designers, as a creative and problem-solving resource, as a driver for innovation, continues to grow on a global level and is no longer an interest only of developed, industrial countries. Even if design is recognized as an important driver for innovation on a global scale, there are still many countries, not the least in the developing part of the world, where design as a process for innovation does not play any significant role neither for businesses nor for society. There is however a growing interest for design as a resource for innovation in developing countries and emerging markets, for instance in Kenya, where the project we base this paper on is taking place.

In Kenya<sup>1</sup> many designers tend to be fine artists and vice versa. Therefore, the development of fine art and design education tend to go hand in hand in Kenya. The design industry was initially driven by the Europeans with famous names coming up in relation to Kenya, e.g. the British architect Herbert Baker, sculptor Robert Glen, painter David Shepherd. Most of Kenya's early designers were however not formally trained. Frugality in design has been part and parcel of art and design even in schools and colleges. Design and art are considered peripheral subjects and are not funded like, say, chemistry and physics. Hence, they lack both materials and facilities, as well as teachers, and as a consequence they all have to be innovative and creative in their use of materials and designs to get by.

Developing countries and regions are referred to as frugal contexts or markets, as they have scarce resources, lack of institutions, and lack of an infrastructure for businesses (Bhatti, Basu, Barron, & Ventresca, 2018; Radjou, Prabhu & Ahuja, 2012). It is however recognized that many people in frugal contexts are creative in using the scarce resources that do exist, but there is a focus on local markets and the own livelihood. These people are not only entrepreneurs in a local sense, but valuable resources when taking the next step toward developing and organizing their activities as enterprises that can become a platform for prosperity and growth through access to international markets. At the same time as those engage in this development take advantage of local resources to create new businesses on a micro level, the business that emerge contribute to development and prosperity also on a macro level.

The aim of this paper is to discuss the value of combining design thinking with frugal innovation for supporting entrepreneurship in frugal contexts. It is based on student projects and research projects within a program carried out in Kisumu<sup>2</sup>, Kenya, as collaboration between entrepreneurs, teachers and researchers from Kisumu, Swedish designers, teachers and design researchers from Gothenburg. The student and research projects took place in the so-called *Sweden-Kenya Interactive Learning Labs (SKILLs)*. Kisumu and Gothenburg are two of the platforms within the program MISTRA URBAN FUTURES (MUF) who is funding the program. Kisumu can be referred to as a frugal area – or frugal market, in terms of scarce resources, lack of institutions, and infrastructure for businesses (Bhatti et al, 2018). Important resources though are the local universities, for instance Maseno and Jaramogi Oginga University of Science and Technology (JOOUST), which are both involved in MUF.

Design as a process has been studied within a Western context, but not to any large extent in relation to frugal contexts. In this paper we want to discuss what can be learnt about the role of

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<sup>1</sup> Kenya became independent in 1963 and in 1964 "Republic of Kenya". The population in 2017 was approximately 48 million, due to rapid growth during the last century. Nairobi is the largest city and capital with approximately 3.5 million in the city and 6.5 in the metropolitan area. Kenya has an estimated GDP of \$85,980 billion in 2018 (\$1,790 per capita). The agricultural sector is the most important one, employing 75 per cent of the workforce, but considered one of the least developed, contributing just 22% of the GDP. The service, industry and manufacturing sectors employ 25 per cent of the labour force, but contribute 75% to GDP (Wikipedia, Kenya, 2018).

<sup>2</sup> Kisumu City, the third largest city of Kenya, located on the east coast of Lake Victoria, has approximately 5-600,000 inhabitants and the metropolitan area has about 1.5 million (Wikipedia/Kisumu, 2018). Kisumu port was founded in 1901 as the main inland terminal of the Uganda Railway and has a history as a trading city. Kisumu has many universities and institutions. Wikipedia provides a list of 27 institutions of which Maseno University (public university), Jaramogi oginga Odinga University of Science and Technology (JOOUST) (public university) and Great Lakes University (private university, with focus on health subjects) are the foremost. Kisumu region has highly fertile land and is suitable for a broad range of agricultural crops and also has sugar and rice irrigation industries. (Wikipedia Kisumu, 2018).

design (thinking) for organising and the making of entrepreneurs and enterprises in frugal contexts. As theoretical framework we will use frugal innovation and design thinking to create Knowledge Clusters (KCs) composed of a number of Project Based Research (PBRs) with subjects, innovations and actors.

## 2. Design and Frugal Innovations

Design is recognized as an important creative process for development and innovations, but also with the argument that the design process facilitates the integration of users' and other stakeholders' capabilities and perspectives when developing new solutions (cf. Carlgren, Elmqvist and Rauth, 2013; Liedtka and Ogilvy, 2011). Design, which Herbert Simon (1969/-1996) defined as "as a course of action aimed at changing existing situations into preferred ones", has, from this general approach, been used to define design, but has also made design almost synonymous with innovation, and with the assumption that the outcomes of design are a positive development. Design is hence more or less understood as development, progress and improvements. It is very often based on product innovation, with Design Thinking coined as a concept for this (Brown, 2008; Carlgren, et al., 2013). In recent discussion about design and innovation, the view of what innovation can be has broadened quite a lot. As a result, design research and practice also now include organisational development and social innovations, both in the commercial and in the public sector (Bason, 2010; Manzini, 2015). This development has provided a more holistic approach towards problem solving and an openness for questioning the problems by firstly defining and re-framing the problem itself, so that the problem, not just the solution, is part of the design process from the beginning.

In 2010, *The Economist* published an article by the journalist Brett Ryder about innovations with many examples of how large corporations adapt their advanced, high-tech products to markets with less purchasing power in so-called frugal markets (Ryder, 2010). An example he mentions is how General Electric's health-care laboratory in Bangalore, India, simplified a conventional EKG<sup>3</sup> machine through reducing the number of buttons, and replacing the bulky printer with a tiny gadget used in portable ticket machines. The whole thing, as well as batteries necessary in an environment with unreliable electricity supply, could fit into a small backpack. It was sold for \$800 instead of \$2000, enabling highly reduced cost for an EKG test (Ryder, 2010). Frugal innovation is however not only about cutting costs through simplification of sophisticated products and reducing features to a minimum; it also about making them robust enough to withstand being used in environments without service infrastructure or stable electricity – and making them easy to use. Frugal innovation – or as it is also called, reverse engineering or constraint innovation – is hence about redesigning products and processes to cut unnecessary costs, in contrast to being a matter of exploiting cheap labour. But as Ryder (2010) adds: it is not a disadvantage to have cheap labour. It is however not only Western based corporations adapting their products to frugal markets. Also, companies on these frugal markets use new technologies to re-think and innovate new products, the whole production process, services and business models within such different fields as hospital surgeries, telecommunications, Internet connections, and kitchen appliances (e.g. fridges that run without electricity). Indian management researchers point to the national tradition of *jugaad*, which means making with what you have, and with that solving seemingly insolvable problems (Radjou, et al., 2012). In Kenya it is called *jua kali*, which in Kiswahili literally means *fierce sun*, though the actual

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<sup>3</sup> EKG or ECG – electrocardiography machine – recording electrical activity of the heart

meaning is getting things done regardless of constraints, or a person, businessman, or entrepreneur that can fix or do practically anything upon request (Wiens, 2018).

Frugal innovation has evoked a lot of interest in recent years, and in 2012 *The Financial Times* newspaper called the concept “increasingly fashionable”. Also, among researchers there is growing interest, and a phenomenon found in countries all over the world (Bhatti et al., 2013; Leadbeater, 2014; Radjou, et al., 2012). There is a tendency though, that frugal innovation in these reports, to be mainly associated with technical products made with fewer features and more durability for markets with low income users and less reliance on the mainstream distribution channels. However, as illustrated by Bhatti (2012), frugal innovation is not just about redesigning products; it has evolved into rethinking entire production processes and business models for the market. A new trend is an emerging interest from Western actors looking at the frugal contexts for radically new ideas for all markets. According to Radjou et al. (2012), it is not only for saving costs but also to use less resources and material, which today are considered important from an environmental perspective.

What is then the difference between conventional and frugal innovation? Bhatti (2012) argues that frugal innovation – in contrast to innovations in Western companies – target the bottom and then makes its way up to benefit all users. An important issue is, of course, resource constraints, and lack of funding, institutions, and infrastructure. Radjou et al. (2012) argue that frugal innovation is more than a strategy. It denotes a new mindset to re-think constraints and liabilities as opportunities. We can start seeing some similarities with Design Thinking: re-framing problems, seeing constraints as opportunities, etc., are, as we know, also claimed by design researchers (Dorst, 2011). Before going further on with this discussion we want to look at the frugal context of Kenya.

## 2.1 The Kenyan context

To understand the Kenyan informal or Jua Kali sector, it may be necessary to delineate it. This is therefore a very short introduction. With globalisation, economic liberalisation, and the resulting technological transfer, the Kenyan informal sector has transformed over the years to its current state. In the traditional Kenyan African setting, design and production were frugal, targeting local village consumption usually through barter trade. Goods were usually limited to items of material culture; examples being jewellery, musical instruments, pottery, vessels like gourds, pipes, hoes, spears and shields. Musical instruments were unique in that musicians invariably also produced their own instruments, or producers of musical instruments were themselves musicians. As modernity set in, frugality became less and less associated with traditional materials and more with cost and availability. Therefore, it became more economical to use, for example, a discarded metal wire to make the strings for an *orutu*, the musical instrument, than the more complicated process of fashioning them from animal tendons.

There are several factors that contributed to the development of the informal sector’s product design and frugality. One was the modernisation of living, to varying degrees, regardless of geographical location. This put pressure on the population to create wealth so as to have disposable income with which to purchase goods and services. There was also urbanisation which has quickly moved people from rural systems with assured communal social security systems to urban, mean capitalist jungles with the further erosion of social support systems occurring every passing day.

Waste generation was also high, thus enabling frugality to be creative and innovative. There were many people producing cooking pots from aluminium cut from discarded drums; used tin and paraffin work lamps; mattresses and pillows made from shredded paper packaging materials; frying pans made from beaten scrap metal, and so on.

Frugality as a desirable trait was further reinforced by the training curriculum of the first African Teachers at Jeans School, Kabete. The training involved both the prospective teachers and their spouses. Thus, frugality found its way into modern living through improvising of teaching aids, home science, animal and crop husbandry, carpentry, knitting, needlework, seamstress work, tailoring and sheet metalwork. Training in these areas was rather basic, with minimal mechanisation and simple machines. There was no formal training for those in the informal sector where knowledge and skills were usually learnt on the job and passed on from one generation to the other. There tended to be a family history in the craft, and with every coming generation there was a desire to move away from manual jobs to more trendy, blue- and white-collar jobs. Traditional designs were often adopted into modern frugal materials as exemplified by the use of discarded old automobile tyres and tubes used in the making of sandals that in Kenya are popularly known as *akala*. The traditional informal designer is now nearly extinct on the Kenyan scene. Informality is now defined by, amongst other factors, the physical location of the business, the business's level of compliance with government regulations, the number of employees, its annual turnover, the quality of its products, and market reach.

### 3. From Reality Studio to Enterprise Development

Development and design projects are rarely smooth and have many stories to tell; problems that could not be foreseen, routes that are changing, events that interrupt, new challenges, etc. All such events occur during a development project. There is no space in this paper to go deep into the mixture of student and PhD research projects within the program of SKILLs, despite losing the richness of them. We describe a few briefly and will then try discussing them in relation to the value of using a design thinking process and to discuss this within the framework of Design Thinking, Frugal Innovation and Entrepreneurship.

*The Reality Studio* is a master course at Chalmers University of Technology in cooperation with Jaramogi Oginga University of Science and Technology (JOOUST) and Maseno University in Kisumu County. The Reality Studio has been running in Kisumu since 2005. The students are mainly from architecture, design and planning. The daily life in Kisumu is in focus, and the key concept is mutual learning in real life with inhabitants and various partners in society. The pedagogical goal is to make students aware of the necessity to understand the social context of their work. The course in the Reality Studio is two months, considered a longer stay in the local Kisumu context, to reach experience-based learning (Nyström, 2003).

One project born in the Reality Studio in 2009 was *New Sense in Nuisance* (Hoogendijk et al., 2009) where the students started to look at one of the big problems in Kisumu: the invasive water hyacinth plant that endangered the fishing water of the Victoria Lake. The people in Kisumu had started to process the water hyacinth into fibres for different use. The industrial design engineering students

experimented with using the water hyacinth fibres for making inexpensive menstrual pads. It is a common problem in developing countries that girls cannot go to school during the menstruation periods due to lack of pads. This project won a design prize in Oslo. The project continued with an NGO from the USA and a producer from India, who are now connected to an entrepreneur in Kisumu. The Reality Studio in 2018 continued to develop the pad product, its packaging, an instruction booklet, and also developed the production line of pads in a small factory with Zingira Community Crafts in Kisumu<sup>4</sup>. Zingira, in collaboration and funding with Akaar Technologies, has then further developed the biodegradable sanitary pads using the fibres from the water hyacinth so as to bring the cost down by more than 50 percent.

The student projects also laid the ground for two research projects, Eco-tourism<sup>5</sup> and Market Places<sup>6</sup>, about business development, which started in the fall of 2012 together with Academy of Design and Crafts (HDK), and the School of Business, Economics and Law, both at the University of Gothenburg. During the same period, universities and enterprises involved in these projects started to engage in global innovation activities, working towards sustainable development, and co-producing knowledge in global network structures.

When the collaboration started, several activities and business were already on-going, but on a local scale. One idea that came up in the early phase of collaboration was developing Dunga Beach nearby Kisumu into an attractive place for ecotourism. Dunga beach is a village, a poor community, totally dependent on fishery. Another idea took on basket production made of water hyacinth brought new designs and connection to the Swedish market through new partners in Sweden.

The development of Dunga Beach into an attractive place for ecotourism became PhD-projects where Eva-Maria Jernsand, PhD-candidate in business and marketing, and Helena Kraff, PhD-candidate in design, worked closely with the local community in Dunga on the theme of participatory design and inclusive place branding. The development of the baskets became another research project with Helena Hansson, a PhD-candidate in design, who worked with Zingira Community Crafts in Kisumu, and Sätergläntan in Sweden.

Both projects, as well as most other students' projects, were based on participatory design methods involving the local jua kali people, other residents in the village of Dunga Beach and those working with tourism and were led by the Kenyan partners in collaboration with the Swedish partners. Several workshops were conducted in the Dunga Beach and the basket projects, with the aim of involving all those who were concerned. This proved to be complicated, especially in the Dunga Beach project, as it was not always possible for people to spend time on these kinds of workshops. The workshops had to be re-organized to enable people to come and go and to still be engaged. It was also a goal to involve women in the workshop, and as a result of this, a female tour guide group enterprise was formed. The Dunga Beach workshops resulted in a number of design projects for

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<sup>4</sup> The project Zingipad-Streamline the production and distribute the pads (Lindvall, J. et al. 2018).

<sup>5</sup> <https://www.mistraurbanfutures.org/en/project/ecotourism>

<sup>6</sup> <https://www.mistraurbanfutures.org/sv/node/234>



waste collection, signage systems, and improved guided tours, as well as the organization of a county-wide tour guide association with male and female representatives.

In the basket projects, several challenges occurred that made new designs, with new colours and technical considerations, rather complicated. To make a long story very short, the people involved from Sweden and Kisumu experimented with different solutions and in the end found solutions that made the baskets attractive for both the local and the international markets. Zingira has continued as a platform and organization for collaborations with Swedish crafts partners, including workshops for developing new ideas that became innovations for the market, and the basis for new enterprises in Sweden and in Kisumu.

## 4. Results – some practical, some theoretical ones

Moving from the short research projects in the Reality Studio master course to the long-term research projects, meant that a more systematic investigation could be provided. The students have proven to be door-openers for new insights and approaches, and the Reality Studio became a nursery for upcoming research based in reality, or so-called Project Based Research (PBR) anchored in practice; for more traditional academic; and for sustainable results for the enterprises involved (Nyström, 2002).

Besides starting the production of the pads for girls in Kisumu, Dunga Beach was developed into an attractive place for ecotourism (Jernsand, 2016; Jernsand and Kraff, 2017). The production of baskets was organized into a stable enterprise that could establish relationships with new customers outside Kenya (Hansson, 2015). The jua kali crafts people were organized by Zingira, who could be referred to as the entrepreneur. The Swedish designer became an important partner in this process to drive the innovation process forward and connect to Swedish partners. The result is a more stable enterprise with regular production and a means for selling in international markets, hence also creating stable and regular income for the jua kali entrepreneurs.

Zingira is presently in the process of streamlining the preparatory process of the pads and developing sustainable packaging solutions to distribute in the communities of Kisumu. A business model was designed to achieve this, and the development of the pads is continuing also with new research funding. Zingira also works with schools and women's groups to raise awareness among young girls about the various ways of maintaining menstrual hygiene and empower young girls in the community. In this perspective it was also a social innovation project.

The invasive water hyacinth that seemed to be a huge problem was turned into a resource for product development. Social problems, such as menstruation hindering girls going to school, were addressed, and the problematic water hyacinth were used to enable affordable solutions. Such innovation processes can be described as frugal innovation, and involve multiple actors including research academies based in various locations all over the globe. The collaboration of different kinds of stakeholders, like universities, voluntary organisations, etc., therefore also have to be added to what comprises and affects frugal innovation.

The projects were indeed transdisciplinary with design, craftsmanship, innovation, engineering, business development and marketing, and have resulted in development of new businesses, stabilizing the existing informal networks, and jua kali entrepreneurs as enterprises, as well as several doctoral theses both in Sweden and Kenya. Good working relations were created even if many cultural clashes occurred. A typical one was differing views of time and when to show up for meetings, although that was not very complicated to deal with (Kraff, 2018). Another example is the fact that in the Kenyan frugal context, people coping with the demands of their daily lives makes it problematic to expect them to participate for hours, for instance, in workshops, as would often be the case in more developed contexts. This was solved through a re-organization of the workshop with tools for short interactions and open access throughout a whole day, which enabled people to participate when they had time. It proved very successful. The workshops and participatory design as a method proved important and gave the participants new perspectives on their own being and activities. For instance, a mapping exercise showed the fishermen how far apart they were from each other, which could lead to a need for more coordinated and collaborative approach to fishing.

The results of these projects also illustrate how a Design Thinking approach, with participatory and co-design methods, with visualizations and prototyping, as well as a focus on the local users' perspectives, could support the growth of the local network. This was seen despite the fact that the projects also showed difficulties or stresses associated with the variances of power, or agency, of the various participants. Especially within social innovation, problems and different pitfalls and power aspects have been brought up (cf. Emilson, Seravalli, and Hillgren, 2011), and in these projects in Kisumu, the difference between the partners from a cultural and power perspective also became obvious. Despite this, there were firm results in the form of new enterprises, and new products that were improving the lives of many and giving new knowledge to everyone involved.

## 4.1 Discussion and reflections

Design thinking (DT) is based on the assumption that the predictability of the results before a project starts, is not possible by using traditional economic methods (Boland & Collopy, 2004; Dorst, 2011). It is thus a process where the focus in the first phase and the framing of the project is on defining and understanding the problem, and requires testing different perspectives, often coming up with a totally new understanding of the problem, i.e. re-framing the problem or situation. The challenge is that there is often a myriad of problems to consider, especially if we face a complex situation, or even wicked problems (Rittel & Webber, 1973), where it is also difficult to get an overview or identify the myriad of problems and their interconnectedness. The design process with its visual tools can support a clustering of the problems to get that overview. DT hence provides the teams with creative approaches that can deal with complex situations where framing and re-framing of the problems and visualization can give a sense of alternatives and envision the consequences of different choices.

We often mention the importance of a design attitude in the process of decision-making to cope with projects that are constantly facing new problems and need continuous re-thinking of how to go forward, but in this case, it was also important to re-think the understanding of the process, build up the knowledge of those involved, and how to make it last beyond the projects. Therefore, a so-called Knowledge Cluster (KC) emerged, i.e. network of those people who have participated in these projects for carrying the knowledge forward. This was developed through long-term collaborations with various partners in the different research-based projects. A Knowledge Cluster embraces

knowledge production, management and dissemination. Evers, Gerke and Menkhoff (2010) highlight the importance of the development of management as well as tacit knowledge in the development of Knowledge Clusters.

This kind of approach is valuable also, or not the least, in frugal contexts and in projects like those that took place in Kisumu. The concept of frugal innovation highlights some aspects that are sometimes forgotten in a non-frugal, developed context where lack of resources is generally not a problem. Kisumu was indeed frugal, which became a challenge and learning process for the Swedish participants. The design process, with its systematic approach to move the process forward – regardless of it being iterative – using the design tools of participation, involving stakeholders, visualization, prototyping, etc, was a learning process also for the Kenyan participants. The principal at Sätergläntan, the Institute for Slöjd and Craft in Sweden, that started a collaboration with Zingira, reflected on his experience (Östlund and Hansson, 2018, p 6):

“At Sätergläntan we have the privilege of being able to choose materials and tools that exist in a certain abundance based on the idea we have and what we want to create. In Kenya there are fewer resources available but an ingenuity and a sustainable mindset about how we can make our idea come true. If the tools we need are not available, we do our own or take something else. If we have no more material, we must be frugal or find something similar or even think about and do in another way. They work frugally, with the resource in the centre and the knowledge as a tool... This means that when we talk about sustainability and economy around our resources, it gets different magnitude based on which perspective and conditions we live under.”<sup>7</sup>

The learning from this project is increased knowledge and understanding of the complexity of working in frugal contexts and also being able to re-frame the workshop and co-design process accordingly. Thus, the assumption behind design thinking is that the process will increase the understanding of the problems or possibilities, support creativity and innovation, and also what is understood as quality and functionality from user perspectives. In these projects the involvement of different stakeholders proved complicated and complex with regard to the different cultural aspects, but also in terms of power relations that are not as much discussed within DT and co-design projects that are generally not defined as social innovation projects (Kraff, 2018). Generally, there is a concern about power relations in projects run by people from the wealthy developed world imposing their way of working as the “better” or “right” way of working. But as the principal from Sätergläntan reflected, there is much to learn from frugal contexts and the way people solve things, which is also the value of looking at frugal innovation as an approach to combine with design thinking.

From a management perspective, a DT approach with a dynamic learning process, multi-disciplinary teams, and trans-disciplinary learning, is necessary to cope with all issues and matters. It was however not only a DT approach that facilitated the participatory processes. It was also obvious that the mindset of frugal innovation became the basis for innovations and entrepreneurship, not the

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<sup>7</sup> Translated from Swedish: <https://www.saterglantan.se/lara-av-varandra/>

least in the basket project which became complicated due to lack of material resources. It was possible to demonstrate the role and value of design for supporting the entrepreneurs, in this case crafts producers, and also show the importance of organizing the process with a design attitude (Michlewski, 2015), another important learning.

Working with the students in a local context has several advantages. Firstly, the students are a source for data collection, idea generation, and communication with inhabitants. Secondly, student projects are useful, neutral tools for communication between researchers and practitioners, experts, and laymen. Thirdly, the students are ambassadors for future development of society.

For projects like this, where the funding comes from different governmental agencies or research funds, there is a need to declare in advance expected outcomes and enable a measuring of the results when the project ends. This is however often problematic, as projects take routes not foreseen and hence can last much longer than planned. A traditional management approach of pre-defined models and linear strategies does not work. The projects do have some milestones; the students' projects have firm deadlines and last as long as the course lasts, whatever the result. Theses or research papers are of course easily measurable items, but their publication can be prolonged even after deadlines and, when proven valuable, with new funding. The creation of enterprises and whether these are successful or not can take a long time, and the enterprises are on-going with ups and downs. In this case one measurable result in relation to the jua kali entrepreneurs was that they were organized into stable enterprises – for the time being – with employees and organized activities to establish a distribution chain that could serve international markets.

## 5. Conclusions

The Design Thinking (DT) approach and the design process' way of re-framing the problems can lead to new aspects and new opportunities not thought of when starting a project. DT is a human-centred approach where tacit knowledge and human needs are in the forefront of an iterative and integrative, multi-disciplinary process.

Knowledge Clusters (KCs) that link different partners from academia, society and industry – with their specific knowledge in different disciplines – take time to build. The common language of design is systems analysis that DT utilizes and is used to bridge subjects and complex situations (Nyström, 2002). The Internet makes KCs viable and is an efficient tool for clusters that are working globally. It can, as seen in this case, connect a poor fishing community with universities and craft communities in Sweden to build knowledge, product development, and trade across borders.

A problem with many projects, not the least those that are funded by governmental aid, is that they are often limited in time, which means that the building of KCs risks being interrupted and consequently needing to be started all over again, is a lesson learnt. In this case, the student projects collaboration that started in 2005 has proven an important aspect in long-term KC building as teachers, both from the local universities and from the Swedish universities, have remained the same. It takes time to build trust and to get enough knowledge of each other to have a smooth

working process. That smooth process is also a needed security for the students who are only involved for a semester.

In these projects, the designers used their design skills and ways of approaching problems to develop the project and lead the process. Designers are mostly facilitating and leading these kinds of projects, but one aspect that needs to be brought up is the power relations between the participating actors, practitioners and researchers. The participatory processes in frugal contexts involving partners from different parts of the world with totally different traditions, habits, views of resources etc., make the situation complex. Kraff (2018) discusses the pitfalls of participation in co-design projects in a well-founded critic of the notion of participative design processes, and the risk of its yielding only the illusion of participation. Jernsand (2016), in her thesis, discusses power relationships within place branding and participatory design. Again, it is important to emphasize the time it takes to build up relationships between the different members of the project team. The continuity of the collaboration with shared setting of goals, but led by the local partners, is important to diminish the risk of imposing foreign ideas that do not fit the context in which they are applied. Without going into a discussion of post-colonialism and power relations in this paper, it is easy to state that the projects in this collaboration were a learning path for all involved. The time aspect is central for creating the relationships that can build trust.

Many countries and regions, not the least in Africa, need to develop entrepreneurship and create enterprises for creating jobs and raising incomes, as well as an idea of a positive future for their young populations. The experience and learning from frugal innovations are of equal importance, as is the process and mindset of Design Thinking. This is, however, not only a learning challenge for the frugal markets. In times where climate changes will force industrialized and Western countries to re-think the use of natural sources, the learnings from frugal contexts will be of significant value for all contexts. A new type of Knowledge Cluster therefore includes not only design knowledge and skills, but also frugal criteria, which means seriously looking at and using what already exists, not only searching for new materials and modes.

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#### **About the Authors:**

**Lisbeth Svengren Holm**, Professor em. in Design Management, University of Gothenburg, Academy of Design and Crafts, former head of Business & Design Lab. Research in design management with a focus on strategic development. Research Interests: design as resource for sustainability and innovation (in frugal contexts).

**Maria Nyström Reuterswärd**, Professor at the Academy of Design and Craft, University of Gothenburg and Chalmers University of Technology, in charge of the cooperation between MISTRA Urban Futures and the Kisumu Interactive Platform (KLIP), and founder of Reality Studio, a master studio at Chalmers in cooperation with Kisumu.

**Godfrey Osago Nyotumba**, PhD in urban planning at Jaramogi Oginga University of Science and Technology (JOOUST). MFA degree (Kenya), Higher Advanced Diploma in HR/PR (UK), Diploma in Urban Management Theories (NL). Research areas include; recreational landscaping, juvenile communication through comic books and animations, and design of public urban space.

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