Executive Summary

Almost 80% of the world's population is currently underserviced or not serviced at all. Being serviced is defined by basic access to running water, electricity and sanitation (Prahalad, 2006). South Africa is no stranger to this lack of service, as the poor distribution of wealth causes most services and products to be available only to a fraction of the population. This document aims to introduce a new way of looking at service design for low income communities. A large part of this project attempts the redesign of certain key business components from an Industrial Engineering point of view, in order to enable the development of a sustainable business model in low-income communities.

The proposed project will aim to develop a service and replenishment model for the low income movie theatre. This involves analysing the service needs of a typical movie theatre and then re-engineering the service to fit the needs of low income communities. This unit will be known as the Busy Box. The scope of the project will include the full design of the service and support systems for the Busy Box theatre as well as logistical, social and technical considerations for this unit. Additionally, this project aims to create a profitable business hub out of the Busy Box Theatre, not only to help reduce income inequality but also to expand the market of large corporations and gain customer loyalty. That way, when these customers enter the mainstream economy, they will be more likely to have brand recognition and will develop a need for certain products and services. Finally, the Busy Box Theatre is meant to transform from a movie theatre by night into an educational support centre by day, providing much needed educational support in low income communities and thus educational considerations must also be taken into play.

It was determine that an offering can be made for 10-20 Rand per viewing. The next step involved designing technological and innovative approaches to overcome the specific challenges faced in these communities. This involved developing a custom design process for the Busy Box and similar business ventures. After this process, the Busy Box prototype was built and tested at Pretoria Boys High School and then moved to a live test in Soshanguve.

The results from the site test of the concept were outstanding. The Busy Box design was capable of producing its own power and running for over 8 months without the need for major services. The Busy Box was developed and transported for less than the scheduled budget of R230 000 and currently maintains less than R10 000 in running costs. Overall this project aimed to create a new theory for developing businesses in conditions where it was previously considered extremely difficult to do so and has succeeded in doing so.

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1. Introduction & Background

1.1 Company Background

Nursaken Solutions is a rapid prototyping company with a passion for developing sustainable social solutions. The company's goal is to engineer products that create upliftment and lead the way to a better future for low-income communities who need affordable and reliable quality products and services. Nursaken Solutions aims to challenge everyday perceptions about what is possible and what is not by using industrial engineering expertise, local understanding and cutting edge technology. The company provides solutions that help solve the challenges faced by low-income communities in an inclusive and sustainable manner.

Nursaken aims to build business ideas and models that aim to reflect the company's core philosophy: Bright, Light and Perpetual. Bright: Nursaken strives to recruit the best and brightest candidates with a passion for making a difference to ensure that they always offer cutting edge solutions ahead that are of the market. Light: Nursaken strives to be a symbol for hope and leadership in underdeveloped and underserved communities by offering a guiding light that enables those communities to be actively involved in building a better future. Perpetual: Nursaken strives to develop lasting solutions that are sustainable from an environmental and industrial point of view, and to provide consistent social benefit.

It was found that there was a severe lack of entertainment services for those communities. In addition, a severe problem with education along with a poor distribution of wealth severely damaged the chances of development in what is known as bottom of the pyramid communities (BoP). Nursaken has been working on a business philosophy that aims to alleviate these issues by tackling all the possible problems with offering entertainment and educational services to low income communities. Nursaken believes that if these problems are tackled in isolation, any progress that is made will be overridden by the other problems. Thus, Nursaken has made it a priority to develop a business model that is capable of tackling the interconnected problems facing South Africa, such as unemployment, poor income distribution and education, in a cost effective, scalable, efficient and technologically supported manner.

In order to test their new business model, Nursaken has launched the "Busy Box". The Busy Box provides a low-capital business model with affordable running costs that creates a relevant business venture in low-income communities. The aim is to provide services and products that were not previously available in those communities. This is going to be achieved by using existing knowledge in the fields of social science, technology, industrial engineering and business to tackle each and every problem from multiple angles until a viable and complete solution can be obtained. Although this is an idea for a business venture, industrial engineering principles in facilities planning, flow management, project management, productivity and logistics are the true reason behind its future success.

1.2 Introduction to the Busy Box initiative

The pilot project for Nursaken's business model is the Busy Box Theatre. The Busy Box Theatre is a redesigned movie theatre designed for low income communities. In order to keep with Nursaken's original business model, the Busy Box Theatre is designed to perform a dual functionality as a business and educational initiative. By day the unit is a virtual, self-sustaining classroom providing learners with world class support and educational services that they would not have originally access to in current circumstances. By night the unit transforms into a simple, sustainable business managed by an owner-operator with the support and partnership of Busy Box headquarters. Nursaken's vision is to provide revenue generation and job creation in the community through ensuring the sustainability and maintenance of the unit.

However, in order to be able to convert this into a successful education and business venture; several logistical, social and service considerations need to be designed. This project aims to build the service and delivery model for the Busy Box Theatre. The first implementation of this concept was scheduled for June 2013 in Soshanguve. In order to keep this business venture affordable, Nursaken aims to deploy units for under R 230 000 and an affordable running cost of R 10 000. The income of the unit must cover the running costs whilst offering free educational services to the local school, as well as equity to a community member.

The Busy Box Theatre must be designed to perform the following functions:

- A Movie Theatre
- Training/Learning Centre
- E-Conference Room
- Survey/Study Centre
- Presentation Venue
- Comedy/Motivation Club
- Electronic Travel Centre
- E-Classroom
- School Support Centre

The National Planning Commission (NPC) was instituted in 2010 to help develop a better understanding of the problems facing South Africa as well as providing solid research and clear recommendations to the government to support their diagnosis. The diagnostic document aims to: "Identify the main challenges confronting the country and to examine their underlying causes. The diagnostic is not a plan – it provides the basis for a plan. South Africa needs an informed discussion about the major issues confronting the nation. The diagnostic document serves to advance this discussion. If South Africa is able to reach broad consensus on its principal national challenges, it will stand a better chance of coming up with sensible and achievable solutions." (NPC, 2011).

The report identified and summarised the following problems facing South Africa as illustrated in Fig. 2:

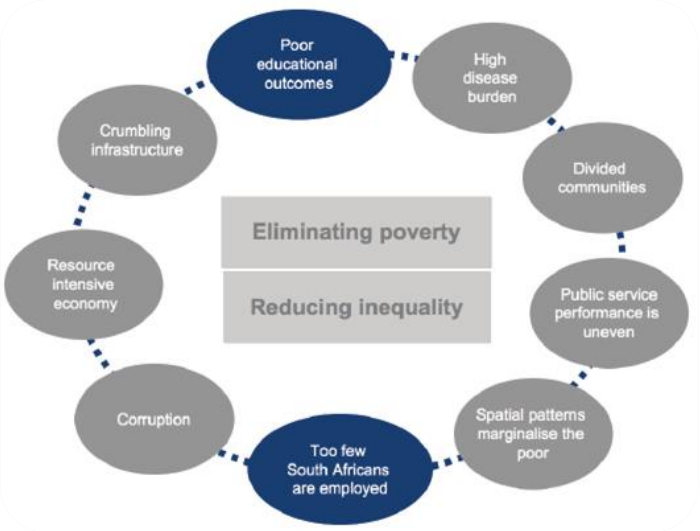

Figure 2: NPC challenges identified in SA (NPC, 2011)

1.3.3 Education Problem

The education problem in South Africa has proven to be a difficult task to tackle. In past years, the matric pass rate has lurked around the 70% mark (Stats SA, 2011). Shireen Motala, who is the director of research and innovation at the University of Johannesburg, is afraid there are major problems that concern this low matric pass rate. In an interview with VOA News she stated: "I think a number of teachers were trained during apartheid, which means the training was not up to standard." She continued, "Secondly we've had many processes of curriculum reform in the last 15 years, which I think has been quite confusing for teachers. And, finally, there is the big issues of language, which we haven't taken enough cognizance of, but I think is a huge problem."

Language is a problem because subjects such as math and science are taught in English from about age 10 and many teachers don't have the English language skills to do so. Motala says it is fundamental that teachers are able to impart knowledge in a way that is accessible to the students.

This comes to show that one of the main problems when tackling this issue is a communication barrier and a lack of skill. These two problems are not addressed or given as much attention as they should in early developmental years of children in the communities and thus it creates a larger problem later on. Some other statistics about the education problem in South Africa include:

Population	**45 Million People**	**Matric Fail Rate (average)**	**30% of Matriculates**
Average Monthly Income	R3000 per person	Number Matric Students	Average 500 000 Students
Cellphone Penetration	80 out of every 100 people	Number Schools in SA	25 000 Public + 2000 Private
Population aged 0-14 years (%)	30% of population	National Education Budget	R233 Billion (For 2013)

Table 1: Education Statistics (Stats SA, 2011), (Stats SA, 2012)

In short, we can see that the there is a lot money spent on education. However, there exists a disconnection between the amount of students, the amount of schools, and the quality of education. There is a clear need for a new philosophy when tackling the education problem. From the statistic on cell phone penetration we can see a hint that the use of technology to assist in this transformation can be helpful.

2. Problem & Project Details

2.1 Problem Details

2.1.1 Problem Statement

Delivering services in low income communities has proven to be difficult. The largest part of the problem is creating a business model that is capable of tackling the interconnected problems facing South Africa, such as unemployment, poor wealth distribution and education, in a cost effective, scalable, efficient and technologically supported manner. In addition to this, choosing the right hardware is a challenge that must always be considered.

2.1.2 Need Requirement / Problem Significance

Although there have been many attempts at expanding the markets in South Africa, only a few of these ideas can be described as truly successful. This is largely due to most of the businesses neglecting the aspects and challenges of a new market before considering it viable to operate in. Businesses aim to almost stamp grid their business model to a community instead of understanding what services are actually needed. These and many other conditions have caused many businesses to disregard this large market and focus on their existing market. However, according to many case studies, BOP community members develop brand recognition and loyalty towards companies who consider their needs and develop products to satisfy these needs. They will even purchase other products under the same brand. DANONE and others, however, have made successful Product Ventures in BOP communities. This is why several large corporations will never truly put their expansion at a halt to their aims to incorporate BOP customers. As BOP customers enter the mainstream economy they become more profitable customers for the businesses.

2.1.3 Project Scope

The shifts and innovations discussed in the literature review can be described as successful. However, a full system integration and evaluation of the all ideas in BOP communities can lead to much more sustainable results. Some literature is available in Industrial Engineering on developing business models and strategies for BOP business development. Supply chain, business process re-engineering, facilities planning and other Industrial and Systems Engineering principles need to be adapted for this specific market in order for Industrial and Systems Engineers to be able to contribute something unique to this shift. This can be done by adapting proven theories and methodologies in those fields to lower income community businesses within a South African context. This will ensure that a full picture of the situation is created and that the business model is developed to address macro issues, such as the socio-economic development challenge, and also to address micro issues, such as cultural differences between different groups or even adaptations to local weather.

Accordingly, this project will include the research, development and testing of the following Industrial Engineering principles for use in this specific market. The design of the system for the Busy Box Theatre will include:

- Design of a Busy Box Facility
- Alternative energy/Power Considerations
- Communication & Security Considerations
- A Usable Scheduling System
- A Low-cost Logistical Replenishment System
- An Income Management System
- An Employee Management Concept

2.2 Project Details

2.2.1 Project Aim

A business philosophy and model should be developed to assist economic growth and BOP business creation whilst reducing income inequality. This model should help redesign high income services/products within a South African context which respects social and cultural differences and align itself with each community's individual needs.

The aim of the project will be to incorporate the above hypothesis in the design aspects of the Busy Box Theatre. This includes focusing on the main long-term goal, which is to design a service model for lower income communities that helps provide products and services while addressing the problem of poverty and income inequality.

2.2.2 Project Approach

After investigating the challenges and obstacles preventing businesses from expanding into BOP communities, innovations from around the world can be investigated which have addressed these or similar problems or at least provides further insight towards finding a solution. It is important to note that this project aims to develop a business philosophy and model, not a charity strategy. Thus, the idea must generate its income and must need minimal outside interference when it comes to finance. Otherwise, it will not attract the right type of community buy in. The project will therefore include the following three phase approach in an attempt to answer the questions presented:

Phase 1: Research and Core Problem Definition

The following questions are significant in determining the areas where primary and secondary research need to be done in order to obtain a more accurate view of the problem.

Community Need:

- What services and products do BOP communities need?
- How much support is there within the community to change traditional business processes?

Service Definition:

- What Industrial Engineering Philosophies are relevant to the design process?
- How can we redesign those services to provide only those that the community is willing and capable of paying for?
- What design process should be used?

Phase 2: Service and Replenishment Model Design

After obtaining the research data, it is necessary to answer the following questions for the service redesign:

Technology and System Engineering:

- What systems are appropriate?
- What is the running cost of the systems? What is the cost of the system?
- Is it possible to fully integrate the system?
- What is the best payment method?

Business Philosophy/Model:

- What does the support model look like?
- What Key Performance Indicators are necessary?
- What training is planned with the business?

Phase 3: Service Model Testing and Future

After developing the model, it needs to be tested on a live business to see how well it can improve service delivery. The following are key questions from this phase:

Model Testing:

- How well did the model react with the business?
- Are there areas where the model is lacking in service delivery?
- Was the necessary training sufficient for using the new system?
- How can we measure the success of a project in a community? How do we measure buy-in?

Risk and Future development:

- What is the worst case scenario or risk model?
- What aspects need assistance in the future growth, scalability and sustainability?
- Is it possible to develop an accurate five year financial projection?
- What are the future support and training requirements?

The full tasks along with deadlines, time constraints & time allocation are listed in Appendix B: Gantt Chart.

3. Redesign & Core Service Definition

3.1 Core-Business Definition

Considering the information above, we can see a clear need for a redesigned service. This is why the typical movie theatre experience needs to be tweaked into core business and non-core business activities. High end movie theatres offer more than just viewing a movie as a core service: they offer world class seating, advertising services and locational convenience (being in the mall). High end movie theatres also only show the latest movies, which tend to be the most popular.

Thus, the core business model is as follows:

The Busy Box Theatre will be redesigned to offer content that is relevant to the community members while being both entertaining and educational to them. This content will range from live to recorded, and will include everything from comedy to action to education. The Busy Box will offer the classical popcorn and drinks for the theatre experience. It will also offer advertising. However, due to constraints on viewing slots, this will not be done before or after a movie. Instead, an electronic advertising billboard will be added to the top of the shipping container. Since most community members are at work from 7Am to 2Pm, the Busy Box Theatre will be used as an interactive classroom by schools during the day. The schools have a central location in the communities. Thus, it is an excellent location for the movie theatre.

3.2 Service Requirements Analysis

From the redesigned core business, we can see that the following aspects are necessary to provide the service:

1. Movie Theatre Layout: Since the idea behind the busy box is to place it inside a container, relevant designs need to be prepared.
2. Content: There has to be a mechanism with which to deliver movies, comedy shows, educational content and other content to the container. This also implies that there should be somewhere relevant to store it.
3. Electricity: The unit should be powered. Since the Busy Box aims to use alternative energy, an appropriate system must be designed in order to meet the power requirements as well as having some sort of backup system
4. Cash Flow: A method has to be developed to eliminate the risk associated with cash flow. This includes considering mobile wallets, vouchers... Etc
5. Advertising Services: A separate content system must be developed to deliver advertising content for the advertising billboard
6. Security: Since there will be some expensive hardware, security needs to be taken into consideration and there should be as many security measures as necessary to protect this asset.
7. Communication: In order to be able to provide interactive content for the schools, relevant communication hardware needs to be analysed.

3.4 Product Requirements Analysis

Another key aspect that needs to be taken into consideration is how to deliver the popcorn and drinks to the system. Are they produced and packed off site and shipped to site? Are they produced on site? Is the community going to use disposable containers and cups? Below are the requirements:

1. Popcorn: A method needs to be developed to deliver kernels or ready popcorn to the system. This method has to effective and must buffer for unexpected problems. Other concerns such as storage space need to be taken into consideration.
2. Drinks: Another supply chain for drinks needs to be redesigned. Drinks are usually large in volume and thus can take up large amounts of storage space at the container.
3. Cups & Popcorn Bags: Relevant considerations need to be put in place for what will be used to place the drinks and popcorn. Is the Busy Box going to use reusable cups or use disposable cups?

3.5 Important Considerations

One of the key problems that will be facing the movie theatre is the cash flow. If the movie theatre does indeed produce significant amounts of money it will be very difficult to secure and manage that money at the container. This will also make it liable to theft. In addition to the cash flow problem, relevant licenses both on the business and movie viewing sides need to be obtained. It is illegal to view movies while charging a fee without having a relevant license. Therefore, legal considerations in terms of the containers placement need to be analysed as well. One of the most important considerations that should be investigated is how to get community buy-in. Although the know-how on getting community buy in does not fall in the field of industrial engineering, it poses a large threat to the business model if the community does not buy-in to the idea. Also, in order to convince the school to place this unit on their premises, the school must obtain a significant service in return. Finally, there needs to be an appropriate method for content selection. The community members have different preferences than higher income communities, and hence, in order to meet their likes, the community should be involved in the selection process through some representatives.

4. Busy Box Design Process

4.1 Industrial Engineering (IE) Driving Philosophies of the Design Process

4.1.1 Green Facilities Planning

In recent years, South Africa has seen the growth of the idea of a 'business in a container'. This involves using a shipping container to accommodate a fully functional business, to trade a variety of merchandise or to support service delivery. There are many businesses that use containers to house their business. These include spaza shops, hairdressers, and even small repair shops. Several problems such as security and cost of investment can be addressed by using a fairly inexpensive container rather than existing infrastructure. However, in order to get an accurate picture of the type and nature of businesses that are possible to be converted into container hubs, an evaluation of the needs of the community must be conducted and business processes must be redesigned to suit these needs. In a site visit to Musina, Hazyview and Phalaborwa it was noted that most local business men use some form of removable asset to run their business (mainly containers).

The ability to redesign businesses to fit into containers can largely be attributed to facilities planning methodologies. Facilities' planning has grown since its inception in the 20th century. This is largely due to the growth in the concepts of what makes a "facility. The principles of facilities planning were never limited to manufacturing facilities - only recently are these principles being applied to higher education facilities, office facilities and in fact any area that encompasses machinery, man, locations and interactions between them. "Facility" became a term for the combination of assets that facilitates a process (Goldstein, 2006).

This growth in the use of facilities planning as a tool has created many procedures, issues and, of course, trends. However, the main trend in the start of the 21st century seems to be the change in direction towards a facility that is sustainable in terms of the triple bottom line of people, profit and planet (Gustavo, 1997). One of the problems facing facilities planning in the 21st century is that most facilities built in the previous century did not plan well for the future. Several issues were not taken into consideration. (Goldstein, 2006) States: an increasing number of education leaders identify the challenges associated with "aging and expanding facilities" as one of the top change drivers in the field, exceeded only by insufficient financial resources, technological change and changing student demographics. In the same report, "insufficient facilities" are also considered among the top threats to the success of education.

4.1.2 Theory of Constraints

The philosophy behind the theory of constraints (TOC) forms a basis for the design process. The TOC philosophy has been used in various environments they can be very helpful in reducing cost and ensuring system stability. The theory of constraints in a management strategy was first introduced by Eliyahu M. Goldratt in 1984 in his novel "The Goal".

(Goldratt & Cox, 1984) Since then it has been used as a successful management strategy to improve an organization's operations in order achieve a desired goal. In essence, it has created a paradigm shift in the way managers look at bettering their business. TOC sees the business as a chain of interrelated links/departments. The theory is that a business is only as strong as its weakest department. Therefore, in principle, the business should focus on improving the weakest department first, so that it can become stronger as a whole.

The theory of constraints is based on the idea of balancing all aspects of the company so that one lacking or weak aspect doesn't bring down the performance of the whole company. This makes it essential to use specific techniques and tools to properly identify and analyse the problem. Although several steps can be taken into consideration, Goldratt's five step model is still the most widely used. Stating that in order to maximize performance of a system one must:

1. Identify the constraint
2. Exploit the constraint
3. Subordinate everything else to the constraint
4. Elevate the constraint
5. Identify the next constraint

4.1.3 Logistics & Thinking "Lean"

Another key driving philosophy is lean thinking. Lean thinking is the systematic elimination of waste by focusing on costs, product quality and delivery, and worker involvement (Ross & Associates, 2000). The 21st century has shown a great need for supply chain considerations, and lean manufacturing specifically has been successful in saving time and money for many businesses. Lean thinking aims to eliminate the following waste (Miller, Pawloski, & Standridge, 2010):

Form	**Description**
1) Overproduction	Producing more than is needed and/or used.
2) Human Resources	Not using people's minds and getting them involved.
3) Transportation	Moving tools/materials to the point of use.
4) Inventory	Materials or information. Includes WIP and Finished goods.
5) Motion	Movement of people (walking, riding) as well as smaller movements.
6) Corrections	This includes rework or fixing of products.
7) Over-Processing	Additional work above the requirements and/or needs.
8) Waiting	Time delays for materials, information or people.

Although these form standard ways to save in manufacturing environments, the Busy Box can benefit by applying the "lean thinking" to its service and product requirements. An evaluation of how lean the design is can help identify problem areas as well as areas which need to be redesigned.

4.1.4 Innovation & Technology Management

Innovation and technology have played a very significant role in the expansion into BOP communities. Innovations such as the mobile banking system and paying via a mobile wallet have become a new and accepted form of payment in many countries. This has assisted many businesses in managing the risk associated with cash flow in rural or unsafe areas, thus resulting in expanded business opportunities and reduced cost of goods and services. According to N Arjun, Chief Projects and Transformation Officer, Airtel Africa, the launch of the world's first virtual payment card on a mobile phone account marked a major milestone in mobile commerce. It places the functionality of a payment card on a mobile device to use for online purchases, offering consumers high levels of security, accessibility, acceptance, and a global reach (James & Deibele, 2011).

With the focus of most businesses redirected towards expanding their market to the BOP communities, we find that a shift in the approach and methodologies used is absolutely necessary. Business has required that technology and science adapt their innovations for the low income communities. Non-Government Organisations (NGO) and Non-Profit Organisations (NPO) have also promoted the shift towards creating high quality products and services in low income communities. Large businesses have found that it is almost a requirement for them to expand their market since there is only so much profit in their existing markets. Since BOP communities form almost two thirds of the world's population, it provides a big opportunity for expansion. However, with the shift towards expansion come many challenges. Many of these challenges concern the business and support model used to deliver services and products.

4.2 IE Philosophies Relevance

4.2.1Green Facilities Planning:

Facilities planning forms a cornerstone in the design process. Choosing the right location and size of the "facility" is a large part of this project. Furthermore, choosing to use of Green facilities planning ensures that running costs are lower and also assists in creating sustainability for the business since it will require fewer resources. This involves analysing the entry and exit cycles of every person and product in order to ensure that minimum waste is produce. In addition to looking at the waste of the Busy Box Theatre, the energy requirements form a large part of Green facilities planning. One of the key aspects of the Busy Box Theatre is that it is completely self-sustaining, and that is why the Busy Box will be designed to use alternative energy. This fits in with the methodology of cradle to cradle (C2C), which requires that, everything that is used in providing the service must be traced back to its source. Finally, the busy box will be designed in a container since it is a movable asset that is commonly used in those communities and most service infrastructure is designed to be able to deal with shipping and moving those containers.

4.2.2 Theory of Constraints:

The theory of constraints is relevant in designing the Busy Box because the entire business model and environment can be considered as a collection of constraints. In low income communities, there is always a shortage of power and products. Several other factors such as capacity planning depend on defining constraints. Finally, knowing which constraints are most likely to fail will assist in designing a sturdier business model.

4.2.3 Activity Based Costing:

Another issue that needs to be analysed is how resources are allocated and used. Activity-based costing provides the best solution to this dilemma. The core philosophy behind activity based costing is that certain systems provide certain resources (which are viewed as constant), from which components use up available resources. This provides a way to identify which components are using what resources, and it helps in developing KPI's in future for monitoring system performance.

4.2.4 Lean thinking:

The idea with lean thinking is to always rethink how much the process is wasting. Since the aim of the Busy Box is to provide the lowest price for admission, waste which costs the business large amounts of money will have to be eliminated as much as possible Although the systems should be reliable and slight overdesign should be added, the system has to be able to run at the lowest cost and highest utilisation level as possible whilst producing minimum waste. Hence, lean thinking is very important.

4.2.5 Innovation & Technology:

If the Busy Box aims to be a successful business and educational concept it has to utilize every available technology that can assist in reducing complexity, lead times, cost …etc. Not only does the Busy Box need to consider current technology needs (due to the speed with which technology is growing), a plan needs to be set in place to monitor the development of current technologies into products. This will help the busy box develop with emerging technologies by looking at its current purchased technology as replaceable hardware that is dependent on the affordable, reliable emerging technologies.

4.3 The Design Process

The idea behind the design process is to allocate all available resources on 3 separate levels. Resources are either stored or used on these levels. Below is an example of the resource diagram as well as a description of the different resource levels:

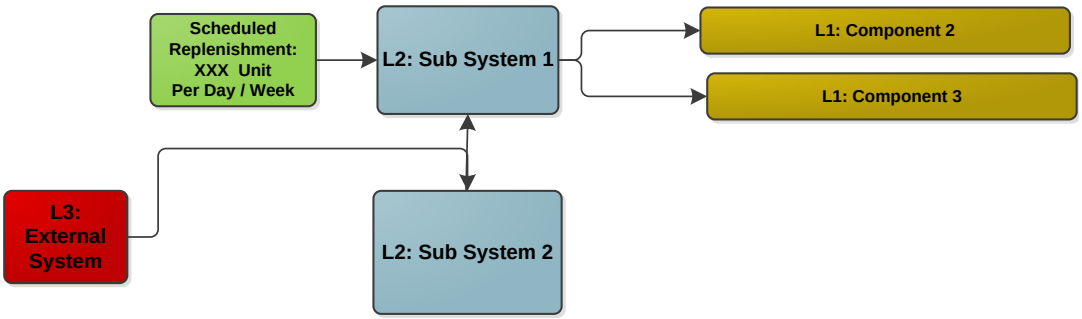

Figure 3: Sample Resource Level Allocation

Level 1 Resource (Component Side):
Level 1 resource can only be used by components themselves and cannot be shared with a higher level system. Level 1 resource can be described as inexpensive and decentralised. They are identified as the resources that already built into a given item (e.g. the battery included in the tablet) or the standard buffer built into a certain component.

Level 2 Resources (Sub - System Side):
Level 2 resources are resources shared by multiple components. Level 2 resources aim to centralise certain core functions into resource groups (e.g. centralized batteries for the popcorn delivery system). In the case of failure of one of the Level 2 resources, components of that Level 2 resource can be moved to another Level 2 resource. Level 2 resources are replenished according to a schedule or according to certain triggers.

Level 3 Resources (Overall System Side):
Level 3 resources are used as a last case scenario to run the entire system. They are the most reliable but the most costly since the alternative is a self-reliant source of energy (an example of this would be plugging the unit into the wall and sourcing electricity from Eskom and incurring an electricity bill).

From the above segments, the design process (when applicable) will be as follows:

Components Side:

1. Determine the requirements in terms of components for the given system based on analysis of similar systems
2. Determine the local L1 resources necessary for operation (L1 Debits)
3. Determine the local L1 resources available for operation (L1 Credits)
4. Apply a waste analysis on the given component to determine its suitability
5. Research available products/ options which can perform better than the given component

6. Apply Steps 2-4 to compare available products/ options
7. Repeat for all components in the system until all waste is removed from the components side
8. When satisfied select the best components
9. Move onto the sub-system design

Sub-Systems Side:

1. Determine the L2 resources that the component will utilize from its given system and interconnected systems (L2 Debits)
2. Design a preliminary system to meet all the requirements of the system
3. Determine the overall resource available for component design from the system design (L2 Credits)
4. When the L2 Credits outweigh the debits then the system is capable
5. Move onto external system design

Overall Systems Side:

1. Determine the L3 debits by summing all the L1 debits
2. Determine a method to obtain the L1 credits necessary to satisfy all L1 debits
3. Determine the daily cost of resorting to the Level 3 resource where relevant
4. Determine necessary service and response times where relevant

*Since the L3 level is not designed by busy box, there will only be a constant which is available to meet the system need. The above design process will be used mainly when designing the power, payment and other technology-related systems. The design process for the rest of the components will be unique and dependant on the relevant text from the design philosophy used.

5. Busy Box Designs

5.1 Hardware Design

5.1.1 Facilities Design

Objective of Facility: In order to meet the requirements of both the business and educational facilities, the Busy Box must be designed to satisfy the largest needs of the two. Also, to be a suitable business, Nursaken requires that a minimum of 25 people must be able to enter per viewing. The facility must cater for a popcorn and drinks area, a seating area, a main isle, an entrance, an emergency exit and, finally, a stage area for life shows. Space should be easy to move in and must cater for all people. Also, everyone needs to be able to view the screen along the 12m container. The seats need to be comfortable and suitable for a movie theatre. From an educational point of view, the facility must feature seating equivalent to normal school seating. The facility requires there to be an area for the teacher to be able to give a class at the front of the container. Most classrooms in those areas are around 30 pupils. Thus, from above we can determine the following:

Level 2: Seating area:

- 30 seats minimum
- Comfortable legroom / Easy Entry into seat
- Possibility of adding desk in future

Level 2: Presentation Area:

- Requirement for whiteboard
- Easy movement space for presenter/teacher
- Must make space for a projector screen

Level 2: Aisle:

- Must be wide enough for safety reasons
- Must allow easy entry and exit

Level 2: Popcorn Area:

- Must allow operator to be able to move comfortable
- Must fit all necessary equipment and space for operators
- Storage of stock must be possible
- Storage of other components.

In this specific system, the resource we are dealing with is floor space. The Level 1 items are components which are defined as the seats, desks and whiteboards/screens. The Level 2 items are the areas allocated above (Seating, Presentation, Aisle…etc.) Finally, the Level 3 is the total available space inside the container. From preliminary calculations, it was noted that a 6m container would not be sufficient for this application. It would not be able to meet the necessary requirements of the Busy Box and could only fit 20 people at max. It would also pose a major safety hazard if something should happen. It was decided that using a 12m container would be more suitable.

5.1.2 Power System Design

Objective of Power system: The power system of the container must be able to provide uninterrupted power to the system for at least three working days. Everything about the product depends on the availability of power, and thus it must be properly designed to ensure productivity.

The power system uses Watt Hours of power as the resource. The Level 1 resource available is the batteries that exist on the components themselves. The Level 2 resources are backup batteries that are charged via solar panels. The solar system only provides a finite amount each day and thus the system must be designed around it. Solar systems are the easiest and most effective systems that can be used in the Gauteng region. Ideally, the complete system should be able to run off solar. Finally the Level 3 is the ability to plug in the entire container to the wall and thus run it off Eskom power. The three level 2 systems that will be running are:

Popcorn & Drinks Area:

- One Popcorn Machine (Typical 2500 Watts)
- 3 Slush Makers for different flavours (Typical 200 Watts Each)
- Ice Maker (400 Watts)

Main Movie System (Core Service):

- 500+ Lumens Projector (Typical over 300 Watts)
- 4 speaker sound system (Typical over 500 Watts)
- Tablet & Storage (50 Watts)

Security, Connectivity & Lighting:

- Five 60 Watt Light bulbs for illumination (300 Watts in total)
- Internet Router + Accessories (30 Watts)
- Security System & CCTV Cams (150 Watts)
- External Advertising Projector (300 Watts)

Component Requirement:

From the requirements above we can see that for the facility design, the following components are required:

- 5 Lights
- 2 Projectors
- 1 Internet Router
- 1 Security System
- 3 Slush Makers / 1 Ice Maker
- 1 Popcorn Machine

After conducting the relevant research on available products and finding ways to eliminate waste, the following decisions were made:

- The projectors use too much power and need to be redesigned. An LED projector would be purchased in order to save energy. LED Projectors also have the ability to have portable batteries which make them last up to 3 hours. These projectors also featured the ability to store data and project directly from the projector's hard drive which allows them to be essentially independent.

- The speaker system was too loud and power hungry for the system and it needed to be redesigned. After sourcing proper technology a system that can perform just as well was found. This system uses a third of the power with the same sound quality.

- The popcorn machine was consuming too much power and would cause major problems in terms of supplying oil for its operation. It also produced a lot of wasted heat and kernels. In order to solve this problem, it was replaced with a hot air popcorn maker. Hot air popcorn makers consume less than half the power while producing zero waste. It also requires no oil for operation and thus simplifies the supply chain requirement needs.

- The security system was too bulky and required a noticeable amount of power. Thus the CCTV cams were replaced with the much simpler IP cameras. The CCTV security system was then replaced with a GSM alarm. The GSM alarm allows for even better monitoring features and it also helps secure the unit by sending SMS's and calling the relevant authorities and managers when a breach is noticed.

- LED lights can be used to replace the typical lights. The LED lights can provide the same illumination for 5Watts per bulb.

- The ice machine was necessary and couldn't be replaced. However, the slush machines were creating a redundancy since they used most of their power to keep the drinks cool, and this was unnecessary because batches of drink would be used up almost immediately. Thus, by buying insulated units that conserved the cold, it was possible to remove the power need to the slush makers. The units will have to feature a motor to crush the ice into slush for the drinks.

Note: With solar systems it's important to buffer for variation in the batteries. If there is a gloomy day then the batteries will not charge. It's also important to remember that the system must produce more than the consumption otherwise the power system will eventually run out of the power. Below is the design of the power system:

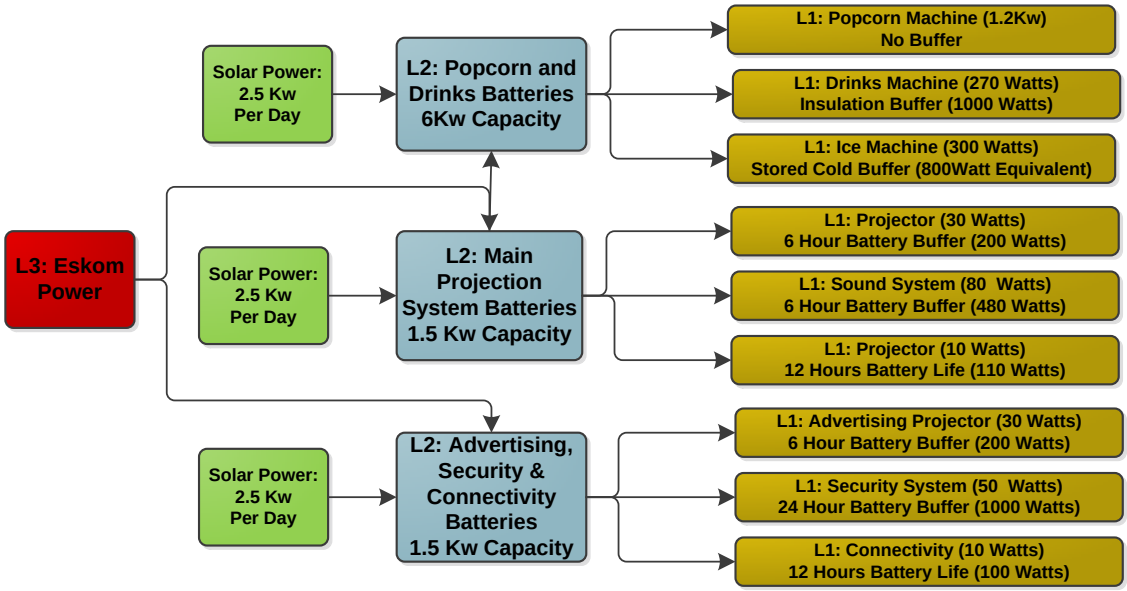

Figure 6: Power Resource Allocation

5.1.3 Connectivity System Design

Objective of Connectivity, Data & Security System: The security and connectivity system is very important in this specific project. In a typical movie theatre, movies are stored on large films and moved to their relevant movie sites. Here, instead of this, the connectivity and data system aims to save the necessary movies and update them accordingly using an internet connection. In addition, the security system also needs an internet or phone connection to be able to send SMS, call the police and send reporting logs. Finally, the entire containers' IT system has a monitoring tool which monitors the power consumption of each component as well as charge levels, charge conditions, number of people in container….etc. These statistics are also sent via an internet connection and can help in future redesign of the container.

The connectivity system uses GB of data as the resource necessary for storage and updating. The Level 1 resource is the space available on each component. The Level 2 resources are the storage system used to save all movies, adverts and educational content. Finally the Level 3 is the ability to steam data via an internet connection or the ability to send the data on the temporary hard drive in the case of connectivity failure.

Movie & Educational:

Daily Data Requirements:

- Three Movies in HD (5 Gb)
- Educational Content (3Gb)

Weekly Data Requirements:

- Twenty Movies in HD (35 Gb)
- Educational Content (20Gb)

Security & Footage:

Daily Data Requirements:

- Security Footage (0.5 Gb)

Weekly Data Requirements:

- Security Footage (3.5 Gb)

Statistics Collection:

Daily Data Requirements:

- Security Footage (0.1 Gb)

Weekly Data Requirements:

- Security Footage (0.7 Gb)

Component Requirement:

From the requirements above we can see that for the facility design, the following components are required:

- Memory Cards / Hard Drive
- 3G Internet Stick

After conducting the relevant research on available products and finding ways to eliminate waste, the following decisions were made:

- Many service providers have very low prices for uncapped internet during off-peak hours. Thus most of the data connectivity for updating movies will be done during night hours where all the data will be updated. Since the entire internet setup uses less than 50 watts on standby mode, it will not be a problem to keep it online during the night when content updating is necessary.

- It will be ineffective to conduct content updating daily and thus content will be updated every week. This will help in balancing power and data consumption and will also make it easier for scheduling.

- In the case where there isn't a 3G connection, a weekly update will be performed manually with a preloaded hard drive. This will be done during the replenishment of popcorn and drinks (which will be discussed below).

- Security footage will be programmed to only send in the case of quality checks, monthly reporting or an actual security breach. There is no need to send all the security data.

- Since statistics require very little data and can be very helpful in problem identification, they will be the only content to be sent daily.

Below is the preliminary design of the security system:

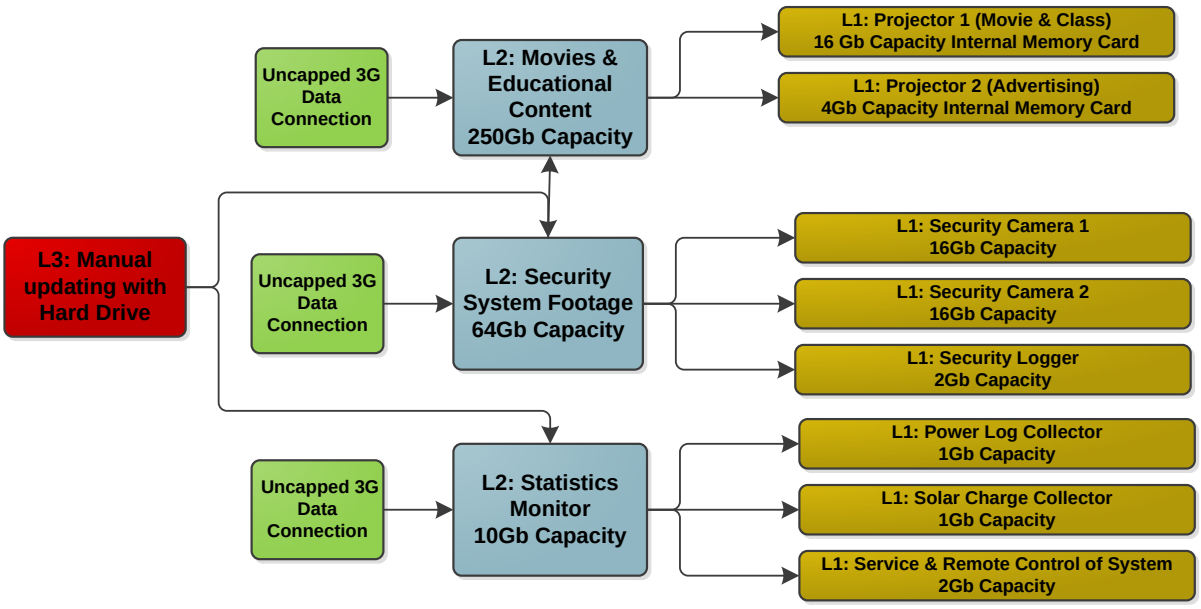

Figure 7: Data Resource Allocation & Connectivity System Design

5.2 Software Design

5.2.1 Service Model Design

Objective of Service Model: The overall objective of the service model is to show as many movies as possible in the hours after school-hours. The aim is to utilize time in the best possible way. The resource in this specific scenario is time. Different timeslots will require different allocations of time. The system is designed to be operated for one operator; however, it is suggested that there be two operators who are capable of performing activities which will allow the operations to be more productive. In this case, the level 1 resource is the time available for an activity. The level 2 resource is the time available in a timeslot (which is fixed at 1 and 2 hour timeslots). The level 3 resource is the time available for movie viewing during a day.

Normal Movie Viewing:

- 1.5 Hour Movie (Can become 2 Hour Movie)
- 0.3 Hours Entrance & Advertising
- 0.2 Hours Switchover & Cleaning Time

Live Show:

- 0.5 Hour Live Show
- 0.3 Hours Entrance & Advertising
- 0.2 Hours Switchover and Cleaning

Note: The advertising will take place outside on the live advertising billboard while customers wait for their drinks and thus there is no need for advertising timeslot while in the Busy Box. Below is the suggested schedule for a full week:

Monday	
Time Slot	**Description**
7am-2pm	School Use / Special Viewing
2pm-4pm	Kids Movie Viewing
4pm-6pm	Teenager Movie Viewing
6pm-8pm	Normal Movie
8pm-10pm	Normal Movie
10pm-11pm	Short Movie

Tuesday	
Description	**Time Slot**
School Use / Special Viewing	7am-2pm
Kids Movie Viewing	2pm-4pm
Teenager Movie Viewing	4pm-6pm
Normal Movie	6pm-8pm
Normal Movie	8pm-10pm
Short Movie	10pm-11pm

Wednesday	
7am-2pm	School Use / Special Viewing
2pm-4pm	Kids Movie Viewing
4pm-6pm	Teenager Movie Viewing
6pm-8pm	Normal Movie
8pm-9pm	Comedy Night (Live Viewing 1)
9pm-10pm	Comedy Night (Live Viewing 2)
10pm-11pm	Comedy Night (Live Viewing 3)

Thursday	
School Use / Special Viewing	7am-2pm
Kids Movie Viewing	2pm-4pm
Teenager Movie Viewing	4pm-6pm
Normal Movie	6pm-8pm
Travel Night (Live Viewing 1)	8pm-9pm
Travel Night (Live Viewing 2)	9pm-10pm
Travel Night (Live Viewing 3)	10pm-11pm

Friday	
Time Slot	**Description**
7am-2pm	School Use / Special Viewing
2pm-4pm	Kids Movie Viewing
4pm-6pm	Teenager Movie Viewing
6pm-8pm	Normal Movie
8pm-10pm	Normal Movie
10pm-12pm	Normal Movie

Saturday/Sunday	
Description	**Time Slot**
Special Viewing	10am-12pm
Kids Movie Viewing (Viewing 1)	12pm-2pm
Teenager Movie (Viewing 1)	2pm-4pm
Teenager Movie (Viewing 2)	4pm-6pm
Normal Movie (Viewing 1)	6pm-8pm
Normal Movie (Viewing 2)	8pm-10pm

Table 2: Viewing Schedule

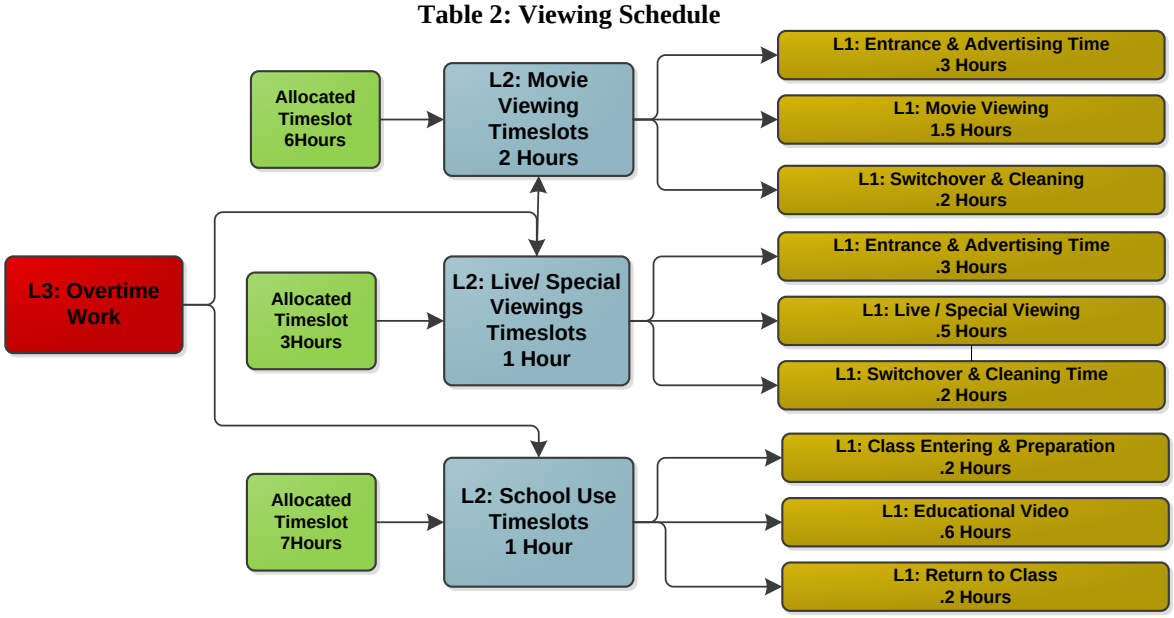

Figure 8: Time Resource Allocation

5.2.2 Replenishment Model Design

Objective of Replenishment Model: The objective of the replenishment model is to serve the popcorn and drinks to the incoming Busy Box customers. Due to this being a redesigned service, there aren't different sizes of drinks and popcorn bags. There is one size of drink and popcorn. However, there are many flavours to add onto the popcorn and drink. It was originally suggested that products should be sent from offsite, but this was determined to be a logistical nightmare as there would be very little place to store all the products and very high costs. Instead, a proper replenishment model was developed to serve this specific business idea. The replenishment model will replenish the movie theatre with popcorn kernels in 1kg bags each week and the drinks with 5L concentrated drink solute which can be mixed with water on site. This is all that needs to be shipped to the location each week to keep it replenished. The level 1 resource available in this scenario is the popcorn and drink ready to be served from the popcorn box and slush machines. The level 2 resources include the stock available that can be converted in minutes into level 1 resource (In stock). The level 3 resource in this case would be an emergency situation which would force one of the employees or managers to buy these two readily available items at a local spaza shop. There should be safety stock for 1 week at all times at the container.

Viewing Type	Viewings Per Month	Maximum Capacity in People (30 Usable Seats/Viewing)	Expected Capacity (80 % of Max)	Min Expected Capacity (20 % of Max)
Normal	52	1560	1248	312
Short Movie	8	240	192	48
Teenager	36	1080	864	216
Kids	36	1080	864	216
Comedy	12	360	288	72
Travel	12	360	288	72
	Max Number of People	4680	3744	1404

Table 3: Capacity Calculations

After conducting site tests to determine necessary capacities, it was found that 5L of concentrate are sufficient for 120 customers while a 1Kg bag of popcorn kernels is sufficient for 30 customers. Although the proposed products have long shelf lives, the replenishment model will work on a bi-monthly basis to ensure freshness of stock. Stock for two full weeks will be kept on site in the case of a problem with the replenishment cycle. Below is the required amount of products using the above calculated capacities:

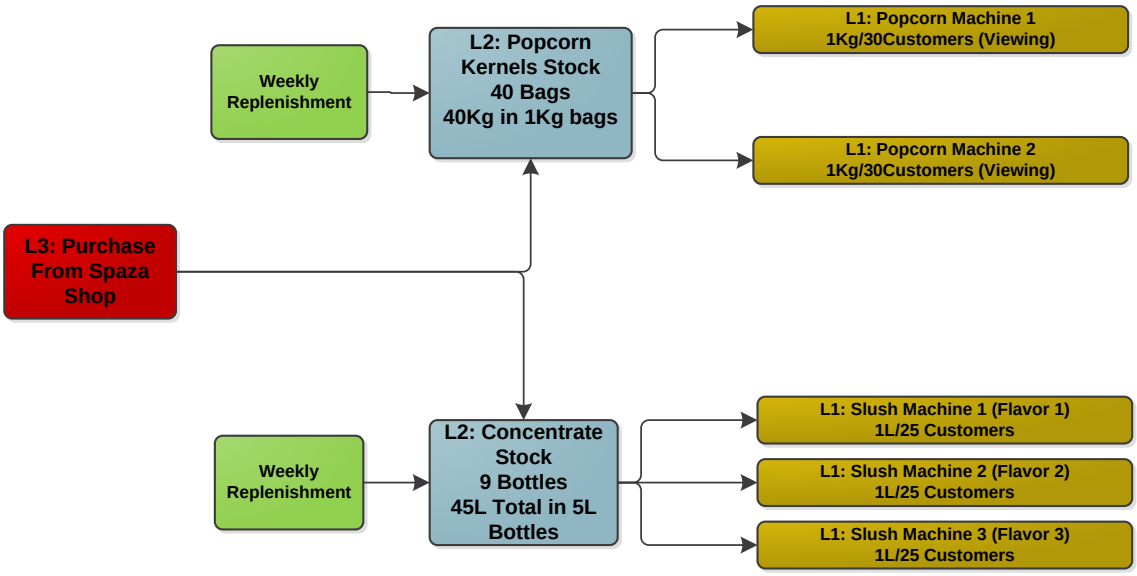

Figure 9: Replenishment Resource Allocation

Important steps taken to eliminate waste:

- In order to simplify stock take, the decision will remain to use 1Kg bags which satisfy one viewing instead of purchasing larger bags.
- Customers will use a set of reusable cups and bowls which cleaned during the viewing or they have the option of bringing their own cups and bowls in order to reduce waste
- Sufficient storage space was designed into the Busy Box to accommodate for two full weeks on stock on site.
- Water for the drinks is available on site to mix with the concentrate

5.3.1 Busy Box Costing

In order to test the potential cost of the Busy Box, a prototype unit was built in March 2013. Pictures of the prototype are attached in Appendix C. This assisted in seeing if building an actual unit goes beyond budget and was also done to test if any aspects had been missed. Below is the costing breakdown for the prototype Busy Box theatre:

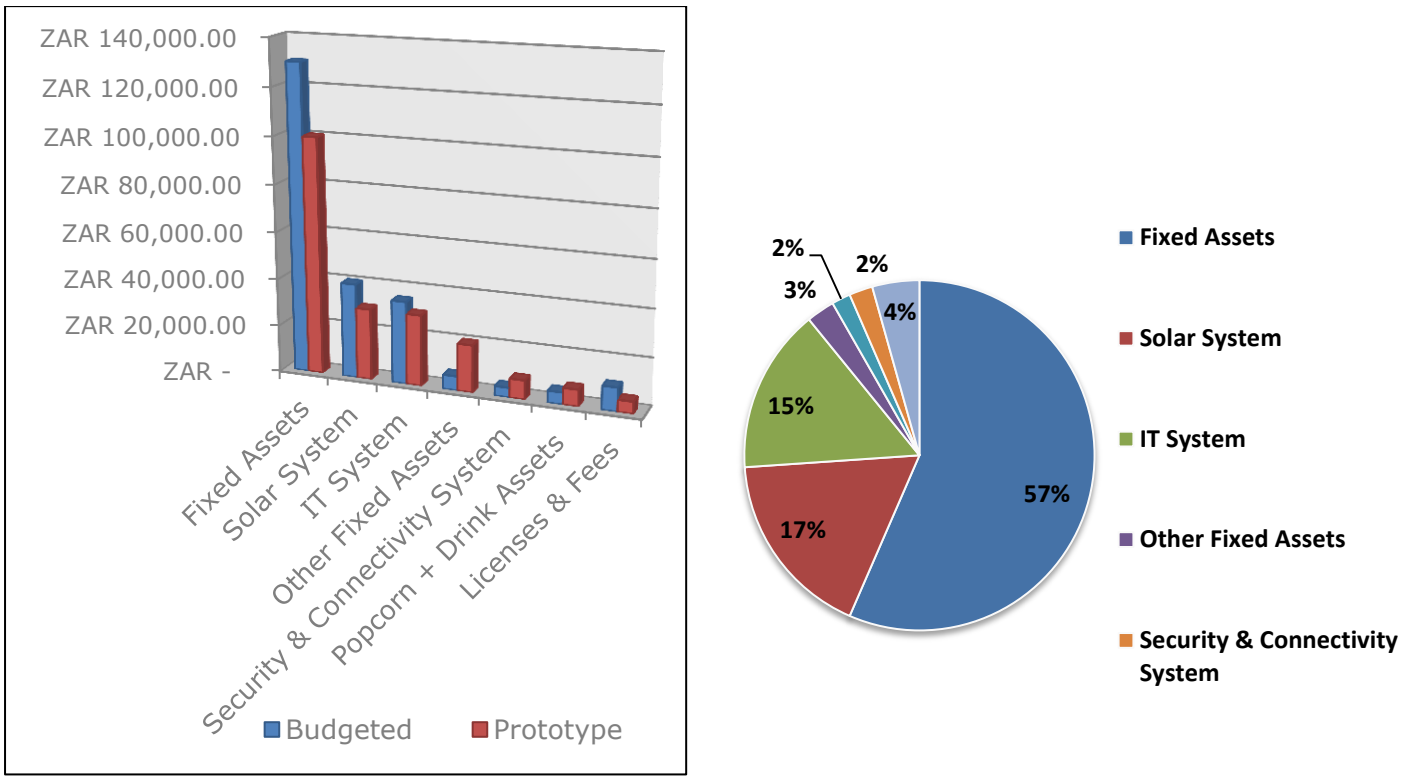

Figure 13: Busy Box Cost Breakdown

The budget for the Busy Box prototype was R230 000, which is the amount of money which can be taken out as a loan to start a business at Capitec and most banks who are interested in investing in low income communities. However, the prototype was developed and sent to site for R200 000, which would mean that there is R30 000 which can be used for operating costs for the first 3-4 months. The unit can be produced internationally at a much lower price and be shipped to South Africa. However, it was recommended that in order to ensure close maintenance contracts for these units it might be best to fully produce and support them locally. Producing units locally also helps the economy and can indirectly help the poor income distribution by training employees.

Since most of the components for the Busy Box are readily available, manufacturing sites can be developed per province and units shipped to site instead of shipping from one centralized location in South Africa (since shipping prefabricated containers is extremely expensive). The prototype was produced by 2 people in less than 6 weeks and thus it is logical to believe that the lead time can be reduced 3 weeks on a large production scale. Prices can also be reduced significantly if tax is claimed and economy of scale implemented.

5.3.2 Busy Box Running Costs

The Busy Box was designed to be as sustainable as possible and thus the running costs must be as low as possible without compromising the business aspect. The Busy Box was designed to use 2 workers with a base salary and profit share. The Busy Box running costs are as follows:

Group	Sub Group	Running Cost	Necessary
Employees	Day Shift Manager	R2000	Yes
	Night Shift Manager	R2000	Yes
Advertising	Flyers	R200	No
	Local Event Sponsorships	R1000	No
Popcorn & Drinks	Popcorn Kernels	R500	Yes
	Concentrated Drink	R1000	Yes
Internet & Connectivity	3G or Satellite Uncapped Connection	R600	Yes
Support & Licenses	Support Services	R2000	Yes
	Legal Movie Purchase	R1000	Yes
	Total	R10 300	

Table 4: Running Costs

5.3.1 Busy Box Income

In order to pay the proposed R230 000 loans or capital expenditure in 2 years with interest and cover its running costs each month, the Busy Box needs to generate around R20 000 each month. The Busy Box has income from 4 main steady income streams. These income streams are stated below along with the nature of the income:

- Ticket Sales: This is the main income from the unit. Shows are priced at R6 and R15 according to age and viewing type. These tickets are sold at local shops and retailers and a percentage of these tickets are given to the salesperson as well as the operator. Variable costs per ticket are the price of printing and delivering the ticket.
- Popcorn and Drinks: The sale of Popcorn and drinks is assumed to be linked with ticket sales. An assumption of 40% of ticket sales will be linked to a popcorn and drinks sale. It is important to state that the popcorn and drinks is cheaper than local retailers and thus it is more likely that customers will purchase some. Variable costs include the concentrated drinks and kernels needed per customer as well as delivery costs for of the raw material.
- Special Viewings: Special viewing sessions can be arranged with the Busy Box at R700 per hour and R1000 for a 2 hour session. These sessions are used by large corporations who would like to hire out a presentation on site or by NGO's who would like to collect survey data. Essentially the facility is being rented out. The variable costs are almost negligible.
- Advertising: Ten 1 minute timeslots are given before each viewing for advertising which allow plenty of time for companies to truly attract customers. Monthly subscriptions of R2000 are paid per company.

Ticket Sales

The max capacity from above is 4680 people (per month) based on a 30 seat fill capacity (out of an available 33). However, in order to simulate a market entry, the minimum expected capacity is used. The capacities along with the viewing type are listed below for quick reference:

Viewing Type	Min Expected Capacity (20 % of Max)	Ticket Price	Profit	Profit at 20%	Profit at 40%	Profit at 80%
Short Movie	48	R6	R4	R 192	R 384	R 768
Teenager	216	R6	R4	R 864	R 1728	R 3456
Kids	216	R6	R4	R 864	R 1728	R 3456
Normal	312	R15	R10	R 3120	R 6240	R 12 480
Comedy	72	R15	R10	R 720	R 1440	R 1440
Travel	72	R15	R10	R 720	R 1440	R 1440
			Total	R 6480	R 12 960	R25 920

Table 5: Ticket Sales Income

After re-analysing the pricing it was found that the best pricing strategy for the services is the following:

Service Type	Ticket Price	Variable Costs	Salesman Commission	Operator Profit Share	Pure Profit
Kids Viewing	R6	R0.5	R1	R0.5	R4
Popcorn & Drinks	R10	R2	R1	R1	R6
Adult Viewing	R15	R1	R3	R1	R10

Table 6: Ticket Profit Income

Popcorn & Drinks

As mentioned before the assumption will be that 40% of the customers will purchase popcorn and drinks. This number is based on the capacity. Below is the profit calculation:

Item	Min Expected Capacity (20 % of Max)	Purchase Popcorn (40% of 20%)	Profit	Profit at 20%	Profit at 40%	Profit at 80%
Popcorn and Drinks	936	375	R6	R 2250	R 4500	R 9000

Table 7: Popcorn and Drinks Income

Special bookings

There are daily timeslots for special viewings that can be booked out by corporates on business days. Bookings can also take the place of weekend viewings. In total there it is assumed there is 20 two hour usable sessions at R1000 per session. Below is the profit calculation:

Session	Min Expected Capacity (20 % of Max)	Profit	Profit at 20%	Profit at 40%	Profit at 80%
Special Viewing	4	R900	R 3600	R 7200	R 14400

Table 8: Popcorn and Drinks Income

Advertising

Advertising timeslots are given before each viewing. There are 10 such timeslots which can be booked for R2000 each for a full month. Other advertising income includes painting the Busy Box with company logos for a full month and distributing pamphlets for each customer. These services are subject to companies that offer services which customers can afford and are reasonably priced. Services which will damage the customers and worsen the income distribution will not be considered. Only services which save money for the customers should be considered.

Session	Min Expected Capacity (20 % of Max)	Profit	Profit at 20%	Profit at 40%	Profit at 80%
Special Viewing	2	R2000	R 4000	R 8000	R 16 000
Spray Paint Logo	4	R900	R 3600	R 7200	R 14 400
Pamphlet Hand-out	1	R500	R 500	R 1000	R 5 000
		Total	R 8100	R 16 200	R 32 400

Table 9: Advertising Income

Total Income

Session	Profit at 20%	Profit at 40%	Profit at 80%
Ticket Sales	R 6480	R 12 960	R25 920
Popcorn and Drinks	R 2250	R 4500	R 9000
Special Bookings	R 3600	R 7200	R 14400
Advertising	R 8100	R 16 200	R 32 400
Total	R 20 430	R 40 860	R 81 720

Table 10: Total Income

It is clear that even at 20% of capacity the Busy Box can cover all of its costs and pay itself off in 2 years. However, what is interesting is the scenario where the capacity exceeds 20%. How the income of the Busy Box is split is what will determine its impact on the poor wealth distribution will determine the success of the Busy Box. Since the main goal of this project is to tackle wealth distribution the business model and not create a hierarchy within a hierarchy, the income needs to be properly monitored. The best management way to tackle this since it is assumed that the two employees of the unit are actually partial managers trying to pay the unit off is to give them full income of the ticket sales and popcorn and drinks. Their extra incomes come from high incentives that were built into each ticket. After paying all running costs and donating a reasonable amount to local schools, they can receive all profits from sales of popcorn and drinks. The prepaid profits, which can become quite large amounts (prepaid bookings and advertising), should be handled separately and used for community upliftment. This includes building other Busy Box units with different services in other areas. In this way more and more jobs are created and it becomes a semi franchise model which assists in growing itself after having one unit per community.

6. Results & Interpretation

6.1 Site Test at Pretoria Boys High School (Educational Aspect)

In order to build the unit and test whether the Busy Box is indeed well designed, the unit was built on site at Pretoria Boys High School in March 2013. This also assisted in simulating the building of the unit offsite. Pictures are attached in appendix D. After completing production of the prototype, the unit was put to the test at the school. The unit was used as a classroom and comedy centre for border students at Pretoria Boys High School from March 2013 to June 2013.

From the site test at Boys High, it was clear that the unit does meet the level expected for a both a classroom and entertainment centre in terms of quality. However, there was one aspect which largely depended on the time of day; this was temperature. Since the Busy Box was designed to fit into a shipping container, some of the students found that it can get either too cold or too warm inside there. However, they also indicated that their classrooms have a similar problem.

When asked whether they would pay for a viewing in the Busy Box, most of the students and staff and boys high indicated a high interest in watching a paid movie in the Busy Box. A lot of praise was also received towards the suggested business model which uplifts the business and educational side of the community.

6.2.1 System Stability

Two months after deployment, all technical systems are stable and functional. Simple instructions were given to the operator when certain components needed to be reset or serviced, and the instructions were followed. This resulted in downtimes of 2-4 minutes. The solar system has withstood rain and cloudy weather since the on-board batteries were able to support the Busy Box for up to 3 days. However, the popcorn and drinks would have to be switched off in such cases. The projector runs between 10-12 hours a day with virtually no glitches and the monitoring system is fully capable of recording ticket transactions, taking pictures at regular intervals with the IP system and streaming live video at any given point in time.

6.2.2 Servicing

After almost 7 months of use since the experiment at Boys High it is clear that the selection of the most serviceable and durable seats was indeed the correct choice. The Busy Box has survived wear and tear at three different locations. The servicing cost is significantly lower than planned and service cycles can be increased to every 6 months to replace worn out seats and other equipment. The cost is also reduced due to the ability to remove individual seat covers and other components rather than removing entire systems.

6.2.2 Security

There have been 2 attempted break-ins into the Busy Box. Both have been unsuccessful and the security system immediately uploaded a short video and sounded the alarm. All removable components are in steel cages and thus it is difficult for thieves to steal any components even if they did manage to get inside. These unfortunate events proved to be a perfect test for the security built both from a hardware and software point of view. The community now believes in the security of the Busy Box concept more and also puts more effort in protecting the Busy Box since they view it as a community asset.

6.2.3 Community Impact

The community has been very supportive of the project and the local ANC youth league has supported it immensely. The unit has provided several free viewings and sessions for the schools. The services provided currently by the Busy Box fall within the categories below:

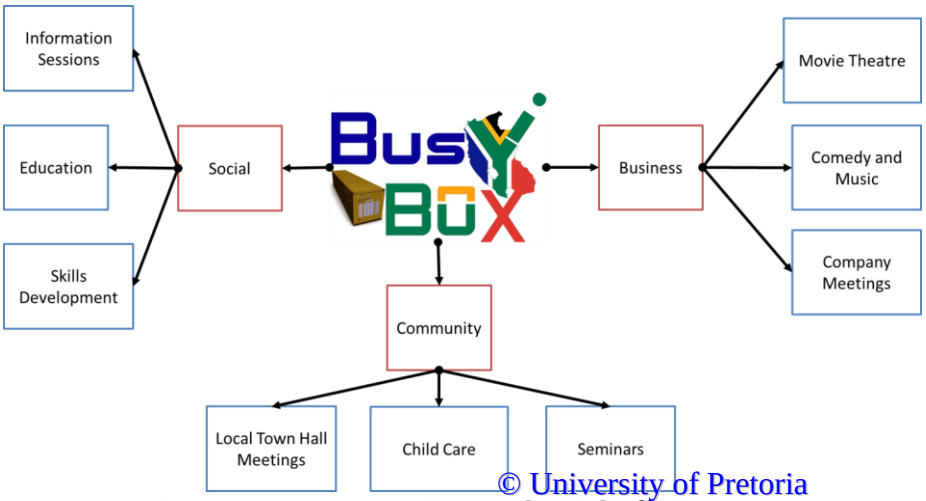

Figure 16: Busy Box Business and Social Offering

6.2.4 Financial Impact

The Busy Box employs two community members from the surrounding areas. They start with a salary of R2000 each. The Busy Box can easily run with one operator. However, it is more convenient to hire support for the business in the case that one of the operators is unavailable. After training and gaining sufficient traction in the market the operators will receive a percentage of the profit share and start the path towards owning their own business. The operators were given some flexibility to test different income streams and make suggestions on how they would like to run the Busy Box. This brought about an important point which is now a key part of the business model. Since the Busy Box offers so many services and income streams the operator can be selective on which income stream to focus on and thus provide a more focused service while maintaining the flexibility of his facility. Most income streams if operated well will cover salaries, bank repayments and servicing costs during the initial payback period followed by pure profit for the operator/manager of the Busy Box.

There have been many paid viewings in the community. Initially the children and the younger generation were the ones who were eager to watch movies; however, the older segment of the market is starting to gain interest in the Busy Box. In order to attract the younger generation specials were given to regular customers. It was found though that R6 is acceptable and ideal as a ticket price for the children. Ticket sales increase during the weekends and public holidays. This was very clear due to the lack of children during exam time towards the start of September and the sudden boom of younger customers towards the end of September. The older generation was hesitant at first to accept the business side of the concept and the value offering for adults can be improved. Ticket prices were offered at a special price of R10 if purchased from the box and can potentially be increased to R12. However, it is clearer that even R1 does make a difference in such an environment, and thus, by perhaps restructuring the model it is possible to get more customers into the Busy Box at a reduced price. Discounts can also be offered to groups. It is still early to analyse the little data available. However, initial responses show that there is a market for such a product and service. Three free seats were given to the local ANC, police and school teachers to encourage more sales and this policy will show immense financial impact in the coming months due to word of mouth advertising. Random free viewings also form part of a good strategy to keep the community engaged.

In the process of building the business model a very important KPI came to be: Free Service Returned Customer (FSRC). Since the business offers so many free services, it is important to build a KPI which measures the business impact. This KPI ratio allows the business to measure the amount of customers receiving free sessions as returned customers by checking sum of Cellphone numbers paying for services divided by the number of Cellphone numbers receiving free service. Ideally this ratio should be around 0.5 or 50%.

6.3 Lessons Learnt

Finally, here are the lessons learnt from the Busy Box project:

- It is indeed possible to design a low capital and running cost business for low income communities which is virtually self-sustaining from a technical point of view
- Industrial Engineering techniques are relevant to businesses operating in such communities as long as the focus remains on applying the philosophies rather than step by step details
- Location of Busy Box units is key and placing such a unit within a potential market of 20 000 will ensure that a large part of them visit the Busy Box at least once per month
- The variety of income streams is not a negative but a positive and focusing on one can potentially make the core business definition more concrete
- Engaging the community is part of the entire process. The Busy Box needs community buy-in to be a true hub for education and entertainment in the community
- The low cost of capital with the Busy Box allows for it to be purchased via a sponsorship, community effort or personal initiative. This is indeed something unique to the Busy Box design.
- Social and Business in low income communities are mixed in many ways and tackling one without the other means trouble
- The Busy Box makes provisions for all problems facing South Africa as a whole. It tackles the unemployment, poor income distribution, service delivery, poor education and lack of skill in a very creative and holistic manner.
- Ensuring that the community only pays for the value offering they want or core service they want is a large part of successful projects in low income communities

7. Conclusion

Developing business models for BoP communities is indeed challenging. The challenge lies with the design process which needs to make every consideration fall within certain available resources and constraints. Otherwise, it will bring up the cost of offering the service. The design process is complete and a fully functional pilot was produced. In addition to this, a model was developed for the splitting of the profit that will be aligned with Nursaken's original vision. In short, the pilot met all the design requirements.

One thing that must be kept in consideration is that the model must always be reviewed and updated based on the available statistics in order to ensure that the business model stays true to its proactive features. Also, future designs must list the ideal future technologies being developed that can assist in lowering service costs and improving reliability. Additionally, method needs to be developed to mass produce the Busy Box.

Another important aspect brought to light in the community is that the box should arrange formal sessions for skills training. There is a major need for this service which, if linked to approve content, could lead to certification. This will largely assist unemployed members of the community gaining the necessary skills during available hours of the day. This can even be an extra income stream.

In conclusion, the structured plans for the Busy Box design lead it to be a design success. Using Industrial Engineering principles ensured that this is not just a business model but it is a redesigned model of an already offered service running as lean as possible. Running costs from the first two month are lower than R10 000. The prototype has immense potential and can potentially start a domino effect, leading other Busy Box services to be produced and put into containers. This is because the Busy Box design process isn't to simply put a service into a container but rather to completely redesign a service to run as lean as possible and produce much more value to the community than income. That being said, the Busy Box in principle has the potential to create new cash flows in low income communities.

Although the challenges for designing for low-income communities might be difficult due to the nature of the limited resources available, it will prove to be very rewarding. As Henry Van Dyke once said:

"There is a loftier ambition than to merely stand high in the world. It is to stoop down and lift mankind a little higher"

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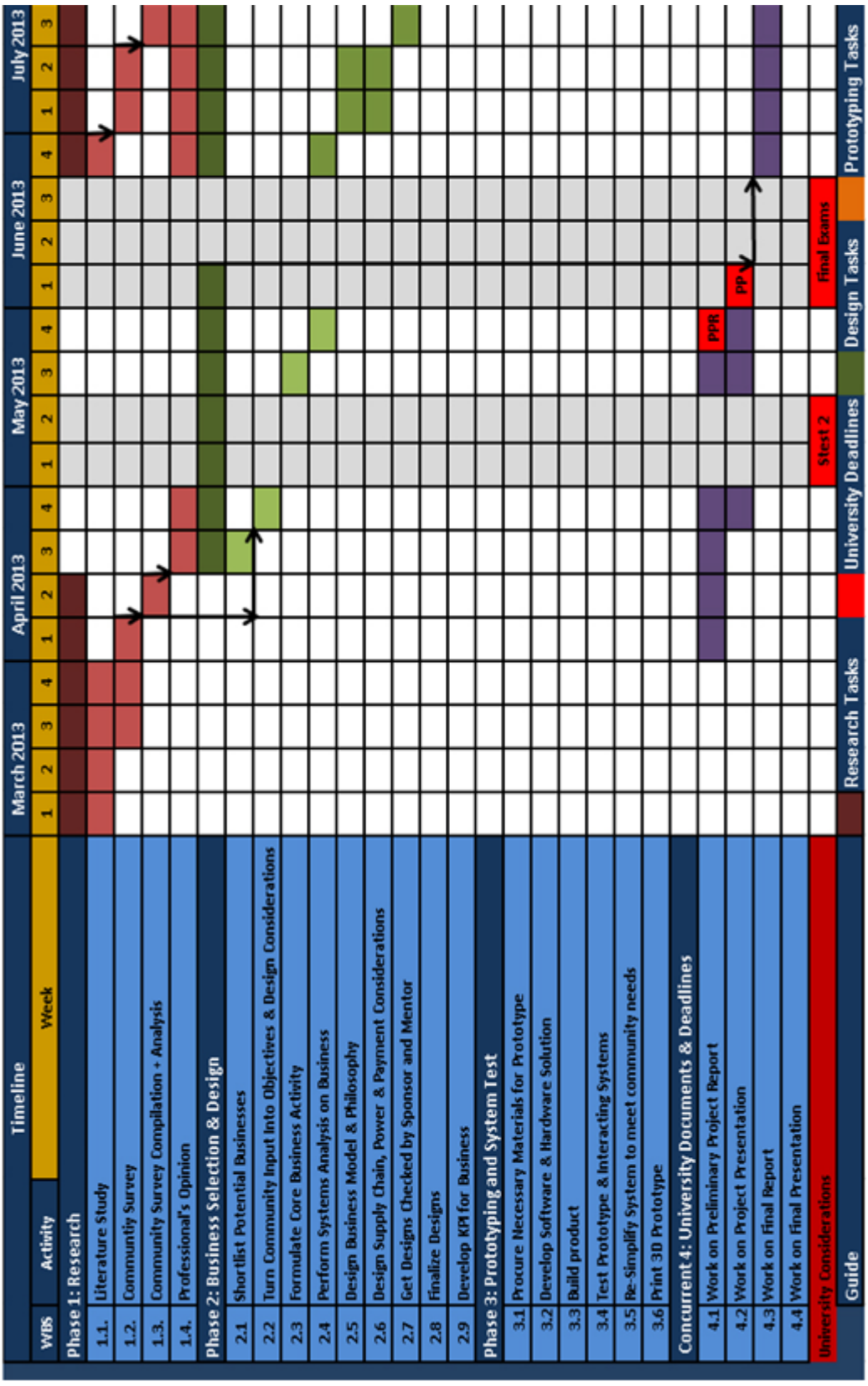
Appendix B: Gantt chart

Semester 1:



Semester 2: