

**REQUIREMENTS ENGINEERING FOR A BIOMETRIC BASED
REGISTRATION AND IDENTIFICATION SYSTEM IN REFUGEE
CAMP MANAGEMENT: CASE STUDY OF THE DADAAB
REFUGEE CAMP**

BY

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DECLARATION

This research project is my original work and has not been submitted for a degree in any other University.

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DEDICATION

This research study is dedicated to my parents Rev. & Mrs. Maingi, my wife Wairimu, my son Jeremy, sister and brother for their moral support throughout the entire MBA program and especially during this research project.

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The completion of this project was not easy. To complete the final document literally saw me sit through some of the nights and usher in the morning without a single wink.

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ABSTRACT

In today's world, human beings are constantly developing systems and technology to be able to make their life easier. Successfully system development is wholly dependent on correctly capturing users need. A system whose requirements were correctly identified will tend to be delivered within the set out time period and budget and as a result, attract more ownership from their clients (Kroenke, 2010).

Various methods have been developed to capture user's requirements. This paper examines Soft Operation Research methodologies which are an alternative to the traditional means of systems development. In particular soft system methodology was used for this study. This methodology was chosen due to its structured approach and the fact it was among the first developed soft approaches.

In complex environments such as refugee human settlement camps, various stakeholders do exist. System development tends to be compounded by various issues with the most critical ones being the 'soft' issues while the technical aspect of system development comes second. The study sought to use SSM in requirements engineering for the biometric system in a camp setting. The findings were then compared to the current system to establish whether or not the proposed project, as identified using the Soft OR Methodology, SSM was viable or not and thus by extension highlighted the pros and cons of the same.

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LIST OF ABBREVIATIONS

CASE	-	Computer Aided Software Engineering
CSF	-	Critical Success Factors
GoK	-	Government of Kenya
GSM	-	Global System for Mobile Communication
IP	-	Implementing Partner
I.P.R.S	-	Integration of Population Registration System
IS	-	Information Systems
IT	-	Information Technology
ICT	-	Information Communication Technology
JAD	-	Joint Application Development
M.I.S	-	Management Information System
O.R	-	Operations Research
POC	-	Person of Concern
PSM	-	Problem Structuring Methods
R.E	-	Requirements Engineering
RAD	-	Rapid Application Development
RSD	-	Refugee Status determination
SDLC	-	Software Development Life Cycle
SSM	-	Soft System Methodology
UNHCR	-	United Nations High Commissioner for Refugees
WFP	-	World Food Programme

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

With the tremendous growth that the information and communication technology (ICT) sector has experienced in the last decade, the management of corporate companies and institution have attached great emphasis on the ever changing and dynamic world of ICT. Various high level management documents including strategy formulation have been developed by organizations in a bid to identify the corporate information needs, the information systems required to fulfil those needs, skills as well resources needed to develop and implement them.

As much as the policies and guidelines for systems are outlined in such documents, it should not be forgotten that system life cycle method supplements information strategies by defining in greater details the roles and responsibility of information system department in all the phases of a systems existence. (International Organization of Supreme Audit Institutions [INTOSAI], 2003) Make note that adopting a life cycle method does not remove project and operational risks; however it will help to reduce them to a more manageable proportion by providing a clearly defined framework of standards and procedures within which to work.

Traditionally, systems are developed using methods such as the 'Waterfall' approach where there are a number of discrete steps which are executed in a sequential manner from requirements gathering, system designing, implementation, verification and maintenance. In theory, a step does not start until the previous step is completed,

although in practice, there is some overlapping. The above method has been criticized by various researchers. McConnell (1996) remarks that the method is not suitable as it is difficult to entirely perfect one phase and as thus if the model were to be entirely adhered to, not possible to move to the next stage of the development. Parnas and Clements (n.d) argue that stakeholders who are non-IT personnel may not be fully aware of the capabilities of the technology being implemented hence what they consider to be their requirements as well as expectations are restricted to "what they think is possible", the waterfall approach thus does not give an allowance for continuous requirement analysis throughout the development cycle

Rapid Application Development (RAD), as the name suggests, was developed in 1991 in a bid to deliver systems within a shorter time. According to Martin and Hunter (1993) the model encompasses the use of prototypes and iterations in the development of system models which are later modified to transform them into the required final system. In recent times, this approach has been used together with other technologies such as Computer Aided Software Engineering (CASE), which aid in coming up with prototypes which are iterated towards becoming acceptable business solutions in the shortest of time. This is more so in today's world where companies compete to maintain their competitive advantage factor. In practice, development of system projects may borrow some elements from both the waterfall and RAD approaches where applicable. The RAD approach is however not suitable for the development of critical systems such as airline control or hospital's life support system as it may not instil the needed confidence for such a system usage (International Organization of Supreme Audit Institutions [INTOSAI], 2003).

Information systems development for international and multinational organizations are more complex and difficult to implement as the operations are being run from different countries, cultures and languages; which does not make it any easier for the development process Kroenke (2010). In the case of multinationals, their headquarters maybe located in different location from where the programmes are being implemented. Decisions regarding the running of the programmes are mostly made at the headquarters level. Most consultations are done with the partners who work with the organization in implementing the programme but more often than not, the management as well as the staff working at the field level staff do not get to express their views about the same and yet in the long run, they will be responsible for the implementation of the decisions that were reached at the headquarters.

Field and site visits are sometimes disregarded or not much time is allocated for them yet they are important so as to be able to gather the requirements of any proposed new system or modifications that ought to be made to the existing systems. Where field visits are made, they are only for a limited number of days and are not able to get a true representation of the situation on the ground since the environment is tailored to favour the guests being hosted, thus create the feeling that 'all is working just right'.

The background below seeks to provide a snapshot of the activities at the Dadaab Refugee Camp. It is a situation where multiple stakeholders do exist, each with their own different goals and objectives although their activities and operations are geared towards serving one common clientele – the refugees.

1.1.1 Dadaab Refugee Camp

According to the World Food Programme (2010) Dadaab Sub-Office Profile, the refugee operation has been in operation since 1991. The camp is located in Garissa district in the North Eastern Province, some 500 km from Nairobi and 80 km from the Liboi border point on the Kenya - Somalia border. The refugee camps- three in number- (Dagahaley, Hagadera) cover an approximate area of 50 square kilometres and are within 6 to 18 kilometres radius of Dadaab town. The camps are home to over 274,000 refugees United Nations High Commissioner for refugees (2010) who consist of registered refugees and persons of concern to UNHCR. The camps continue to receive an influx of refugees fleeing fighting in Somalia, this is despite the border being officially closed by the Kenyan Government as from 2007.

UNHCR and WFP work together to provide humanitarian assistance to refugees around the world including food aid. Whereas UNHCR is the lead UN agency responsible for the protection and assistance of refugees and is mandated to manage the camps (Dadaab and Kakuma) as well as register the refugees upon their arrival on behalf of the Government of Kenya, WFP is the Food Aid Organization of the United Nations mandated to respond to humanitarian and development challenges including provision of food to targeted beneficiaries.

1.1.2 Operational Procedures at Dadaab

Various Implementing Partners (IPs) have been contracted by lead agencies UNHCR and WFP to be able to handle specific activities related to the camp management including water sanitation and hygiene, health and nutrition, education, children and vulnerable protection, social and psychological support and care etc.

A person arriving at the camp and claiming to be a refugee is first treated as a person of concern (POC). They are received and issued with a temporary waiting slip, as a first step in the registration process which entitles them to receive assistance. The slip is valid for one year, the period where one awaits for an RSD interview, which is conducted by RSD officer to determine the refugee status of the individual as well as determine whether one is eligible to remain in the country as a refugee. A ration card, which is document upon which all services at the camp including shelter, healthcare and food, is also issued.

The ration card is presented at the food collection centres during food distributions where it is cross checked against the manifest- the document where all the cards are listed in a chronological order by the family sizes before food is issued. The card is then punched off at the exit point as evidence that it has been used to collect food for that particular cycle. Since the cards do not bear the holder's photo, they have been abused both by the refugees who in one way are able to acquire multiple cards in order to increase the amount of food rations that they receive per distribution. Some impoverished natives national in the area have masqueraded as refugees and acquired the ration cards which they use to receive humanitarian assistance which is targeted for genuine refugees. The mere manual system of using a printed a manifest to cross check on the persons receiving food aid is not full proof enough to safeguard against multiple food issuances to the same beneficiaries. (Swiss Forum for Migration and Population Studies, 2006).

The current manual system lacks the capacity of verifying whether the person who is collecting food is indeed the registered person, the family representative or the owner of the card. Due to unavoidable factors such as illness, a representative may be sent to

collect the food on behalf of the family hence one person may be carrying more than one ration card at the distribution, although this is highly discouraged.

Factors such as new births, in-situ registration (registration of persons who arrived in a previous period but reported for registration later) as well as family reunifications have made it difficult to be able to establish the exact numbers of refugees in the camp. Due to the above, the issuance of new cards as well as replacements is a continuous and simultaneous process and in the process, situations have arisen where lost cards which had been reported as missing and a replacements cards issued are not removed from the manifest and when such a card is presented at the distribution, food is issued against the cards. The above provides a loop hole for abuse of the system as noted previously.

1.1.3 Camp Biometric System

The first joint verification of refugees involving UNHCR and GoK staff was first done in 2005, but when the fingerprints were scanned, it revealed over 4,000 Kenyans had registered as refugees. These people were unfairly enjoying international protection and being resettled abroad as refugees. The exercise also revealed quite a number of refugees who had fraudulently acquired Kenyan identification documents. Following the verification results, it was decided that the exercise be repeated in Dadaab in 2009 to clean the database so that only genuine refugees are identified and maintained in the database. This time round, photographs would be captured and all the refugees were to appear in person. Refugee identification cards are being issued to all those who have undergone through the exercise. So far, quite a number of those who were claiming to be refugees have been deactivated and the initial camp population figure brought down by over 26,743 (Ministry of state for immigration and registration of persons, 2010)

The high impersonation cases meant that more was needed at the camps in terms of the food requirement and thus, increased donor assistance. As in any normal economic setting, resources are limited as compared to the ever increasing needs; hence it has become paramount to account to the donors that what is given as aid to assist feeding the refugees is not being abused either by individuals or the systems that are in place.

Expected benefits of a biometric system implementation at the camp include:

Accurately determining the actual numbers of refugees in the camp and dealing with the impersonation cases both by the refugees as well as local host community who masquerade as refugees and thus savings on the budget presented to donors.

The database will be shared with other agencies working in the camp and hence streamline the provision of other services to the refugees.

The Kenyan Government and in particular the Ministry of Immigration will also benefit from such a system as it will be able to establish the exact number of refugees that it is hosting and from which countries and as a result, be in a position to better plan for the region. The encampment policy that has largely been violated by the refugees who leave the camps in search of opportunities in towns will be easier to implement and monitor. Security, in light of recent terrorism activity, will also be enhanced since all those entering from that part of the boarder will be thoroughly screened.

1.2 Statement of the problem

Hardware, software, data, procedures and people are all involved in the development of information systems, thus a lot more than just programming and technical expertise is required. This is mostly at the requirements gathering stage where coordinated teamwork

of both specialists and non-specialists is required. Even more difficult, system development aims "at a moving target" as requirements are bound to change during the development procedure. The bigger the system and the longer the project, the more the requirements will change (Kroenke, 2010)

System development is usually difficult and risky process and thus many projects are not completed and of those which are, they exceed their budget and time or never satisfactorily accomplish their intended goals Kroenke (2010). Dadaab refugee camp is one such setting where various partners are working together but interested in different components of the same information which revolves about the common client that they are serving – the refugees.

In their book *System Analysis and Design Methods*, Whitten, Lonnic, and Kevin (2004) criticise traditional methods for making general assumptions which don't hold true in all situations. Firstly, the traditional methods assume that problems associated with existing or proposed system are always well defined. Secondly, they hold the assumption that there exists a single, optimum solution. They also assume that a scientific approach to the problem solving will work well and finally, there is the assumption that technical factors will tend to predominate. On the other hand, they credit soft systems approaches for treating all problems as being "ill defined" thus not easily quantified. They fact that the method is participatory ensures that the solution that is identified is wholly owned by all and thus any resulting changes from this approach will most likely be accepted by most of the people.

SSM in particular is considered an easy approach which is phrased in a manner that is easily understood even by non technical persons. The method only requires a writing material and surfact to be able to undertake any study.

Traditional methodologies for requirements elicitation in such a situation may not be ideal and this study sought to use a non traditional approach for requirements elicitation and system development and. Soft Systems Methodology was chosen as it provides a better opportunity to capture the all stakeholder's views and address both their 'soft' and 'hard' needs especially in such a setting where there exists various management structures, different management styles (red tape in Government against matrix in NGO's) , differing cultures and attitudes among the staff on running of institutions.

1.3 Objectives of the study

- 1) To undertake requirements engineering for a biometric system in a camp setting using Soft Systems Methodology and by extension, highlight other opportunities that may arise from the implementation of the proposed system in camp management.
- 2) To conduct a comparison of the SSM proposals versus the current system highlighting what is currently systematically desirable and culturally feasible as a present day solution to the running and management of the camp.

1.4 Importance of the study

The research findings resulting from this study will be beneficial to various groups. Firstly for researchers and academicians, the study will establish a basis for future research areas while the findings and conclusions will add to existing knowledge base.

Secondly, for the Dadaab camp management, the report will help modify the existing proposal on the system to be adopted for the registration and verification system

Thirdly for development agencies and NGO's operating in similar refugee operations, they will benefit from the lessons of implementing acceptable and operational systems in complex environments as well as appreciate the importance of correctly identifying user's requirements as a way of managing the overall time and budget constraints in project implementation.

Finally to the Kenyan Government, It will benefit by having an opportunity to employ upcoming ICT development policies and practices while working with the international development partners operating in the refugee camp.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of systems development

Information requirements for a new system identifies who needs what information, where, when and how. Requirements analysis carefully defines the objectives of a new or modified system and develops a detailed description of the functions that they system must perform. "A system that is designed around the wrong set of requirements will either have to be discarded because of poor performance or will need to undergo major modifications" (Laudon & Laudon, 2006).

Ralph and George (2007) cite the United Airlines who used \$ 250 million to develop a baggage system whose annual operational cost was \$ 70 million yearly. Soon after implementation, the computers were overwhelmed by the data from the cars carrying the baggage. the chief operating officer Mr. McDonald was quoted "We have come to the conclusion that going to a manual approach is the best". This just goes into showing the importance of the system development especially where large amounts of resources are used to be able to realize the system.

2.2 Requirements Engineering

Philip (2007) observes that a requirement can range from a high-level, abstract statement of a service or constraint to a detailed, formal specification. He further defines Requirements Engineering (RE) as a sub discipline of systems engineering and software engineering that is concerned with determining the goals functions and constraints in hardware and software systems. RE also involves the relationship of these factors to precise specifications of software behaviour, and to their evolution overtime and across

software families. RE process begins with a feasibility study activity. If the feasibility report suggests that the product should be developed, then requirements analysis can begin. Since software engineering is a human endeavour, particularly with respect to understanding people's needs, RE draws heavily from such disciplines such as philosophy, cognitive psychology, anthropology, sociology and linguistics.

O'Brien (2000) defines RE as "an in-depth study of the end user information needs which produces the functional requirements that are used as the basis for the design of a new system". Functional requirements also referred to as capabilities, specify that which the delivered system must be able to do. Non-functional requirements specify how well the system will be able to perform its functions. It deals with the issues of 'quality of services requirements' such as availability, usability, reliability, maintainability etc.

Wiegiers (2003) defines RE as "Systematic requirements analysis". The requirements phase maybe broken down into requirements elicitation which involves (gathering, understanding and reviewing the needs of the stakeholders), requirements analysis (checking for consistency and completeness), specification (documenting the requirements) and validation (making sure that the specified requirements are correct). The RE process ensures that systems requirements are defined managed and tested systematically.

From the above definitions, it is clear that the purpose of RE is to ensure that a product development teams builds a system that satisfies the customer and meets the user's needs. It is the first activity of the development process and it is intended to establish what

services are required from the system and the constraints on the system's operation and development. In their research, Colin and Idris (1997) state that most RE research and practice embodies a philosophy that is referred to as abstractionism, which involves the building of simplified models of domains of discourse and proposed systems. For the abstractionist, the main issues in RE practice are the consistency of these models and their faithfulness in their essential details to the reality being modelled; they make use of formal models such as goal dependency networks. An alternative design philosophy is contextualism, according to which the particularities of the context use of a system must be understood in detail before the requirements can be derived. Contextualists use qualitative methods to uncover and help interpret these particularities.

Americo, Phil, Alessandro, and Awais (2007) make note of a new requirement engineering approach whereby there is a separation of concerns in the problem space by introduction of modularisation of requirements. Aspect-Oriented Requirement Engineering has been developed recently by researchers with the aim to improve separation of concerns at the requirements level by offering new ways of modularising systematic requirements in units called early aspects. Requirements are scattered over and tangled with various requirements units hence it makes it harder to be able to be able to come up with the right system. The proposed solution to this requirements modularity problem tries to separate concerns that impact several other modules, including broadly-scooped non functional requirements such as security, safety and performance into a single module as well as specifying how this module (the early aspect) constrains and affects the others.

The requirements analysis process entails: Requirements elicitation, analyzing the requirements and recording down of the findings. According to Ralph and George (2007) there are four techniques which can be employed in the above. The first one is asking directly. This approach works best for stable systems in which the stakeholders and users clearly understand the systems functions. The role of the analyst is to critically and creatively evaluate the needs and define them clearly so that the system can best meet them. The second one is by use of critical success factors, (CSF) Here, managers and decision makers are asked to list only the factors that are critical to the success of their area of the organization.

An IS plan is the third method that can be employed. The IS plan translates strategic and organizational goals into system development initiatives. Working from these documents ensures that requirement analysis will address the goals of the top-level managers and decision makers. Lastly, is the use of CASE tools. CASE tools are a class of software that automate many of the activities involved in the various life cycle phases including establishing the functional requirements or in the prototyping phase.

Indeed many systems failures are as a result of poor requirements definition. Many requirements elicitation techniques have been developed by researchers in order to aid analysts in effectively determining user needs but few have been used by the same practitioners and corporate who ignore them and rush into coming up with systems without following the process as it ought to be (Kroenke, 2010)

Regardless of the method being employed in the coming up of a new system, be it the traditional SDLC method, the use of prototypes, JAD or RAD, the first step of all these processes involves getting the requirements from the users. Whether a new system succeeds or fails largely depends on the roles of users, the degree of management support, complexity of the implementation project and how the whole process is managed. A properly conducted RF process increases the chances of acceptance of the delivered system by the users.

2.3 Biometrics Systems Concept

New systems technology and concepts such as biometrics which are on-demand systems are being developed and incorporated into everyday use. In the modern world that we are living, biometrics are taking a centre stage in various critical activities that human beings do engage in e.g. travel and ports of entry into countries, personal identification, banking, access to public services and voter registration.

Micki & Harold (1998) define biometrics as "a methods of uniquely identifying human beings based upon one or more intrinsic physical or behavioural traits". European commission joint research centre (2005), define biometrics as "any human physical or biological feature that can be measured and used for the purpose of automated or semi-automated identification".

According to the European commission joint research centre (2005) biometric technology may be used for verification purposes and this entails a one on one comparison of the captured biometric with the stored template to verify that the individual is indeed the one who he claims to be. When used for identification purposes, there is normally a one to

many comparisons of the captured biometric against a biometric database in attempt to identify an unknown individual. Biometrics are also used to screen people against a watch-list, especially at countries ports of entry.

Following is a discussion of the components and features for biometric systems as well as key issues that need to be addressed in the implementation of such systems.

2.3.1 Biometric performance criteria

The first time that an individual uses a biometric system is referred to as enrolment phase which stores the person's biometric information. Micki and Harold (1998) describe biometric system performance using the criteria below.

False acceptance rate or false match rate (FAR or FMR), is the probability that the system will incorrectly match the input pattern to a non-matching template in the database. False reject rate or false non-match rate (FRR or FNMR), is the probability that the system will fail to detect a match between the input pattern and a matching template in the database.

Receiver operating characteristic or the relative operating characteristic (ROC), is used to determine how close to the template the input needs to be for it to be considered a match.

Equal error rate or crossover error rates (EER or CER), is the rate at which both the accepts and rejects errors are equal. Failure to enrol rate (FTE) which is commonly caused by low quality inputs, is the rate at which attempts to create a template from an input is unsuccessful. Failure to capture rate (FTC) is the probability that the system will fail to detect a biometric input when presented correctly and lastly Template capacity is the maximum number of sets of data that can be stored in the system

2.3.2 Biometrics functioning and current research

Luisa Bruno, and Mario, (2005) suggest that biometric access control maybe effective both at the logical level as well as the physical level. In cases where a large group of people are expected to use a biometric system, user's acceptance is a key factor for the success of complex biometric implementations as well as choice of the practical kind of biometric technique most suitable. The implementing team must be able to take account of the user's social aspects and attitudes, achieve a consensus among the stakeholders, ensure that familiarization sessions of the biometric system are done as well checking that the environmental considerations are factored in when making the final choice of the system technology to employ all in a bid to ensure that there is user acceptance.

It is worth to note that all biometric features are deemed 'unique' but some are less 'distinct' than others and thus less useful for automated identification purposes. As much as the use of biometrics increase security, biometric identification is not 100% certain as it is vulnerable to errors as well as spoofing. Biometric systems are only one part of an overall identification or authentication process and other parts of the process play an important role in the overall effectiveness of biometric systems (European commission joint research centre, 2005).

Mordini, Wright, Paul, and Guido (2009) observe that research to discover the ultimate biometric system that is accurate, non-invasive, privacy enhancing, easy and cheap to collect and validate is still on and such a system will combine both the physiological and behavioural characteristics of an individual for it to be successful. Most systems are designed for people who fall within the range defined by the system commissioners,

designers and administrators as 'normal'. This system classification excludes majority of users, notably the elderly or disabled people who maybe lacking the features that the system is using as identification parameters.

Most elderly people or those suffering from injuries and disability are slow to process through the biometric enrolment and verification steps. They also suffer sensory impairments e.g. poor eyesight, arthritic hands, fingerprints are worn out, poor memory and as such, the system may reject them as their features are not distinct enough. If the system's threshold for acceptance matching is set low to accommodate this group of people, they may suffer from identity theft, thus such a system may not work for them. Regardless of the technology, cross-cutting issues common for any biometric system include: security, privacy, cost and interoperability (European commission joint research centre, 2005).

2.3.3 Biometric usage in Kenya

In most developing countries, this technology is yet to be adopted. Part of the reason could be the cost involved in setting up this technology as well as the fact that most people are yet to comfortably meet their basic needs making this technology to be out of reach for many. Basic technology such as mobile phone and GSM technology is yet to be utilized by all although the numbers are steadily going up

Here in Kenya, the Government has launched the integration of population registration system (IPRS) programme, which seeks to incorporate most registration processes including the third generation identification cards and passports, birth and death certificates, driver's license, motor vehicle logbooks, payroll, pension, land information

and local authorities and most recently the judicial system. These processes will be automated and processing will be done in real time such that once biometric features are captured and application is completed the data will be available for processing immediately thus no more forwarding of raw data from the districts to the various headquarters. There are plans to install Visa Issuance Systems which will replace the current manual 'visa stickers' at all border crossing points for cross border management and thus register and keep accurate data for all aliens entering or leaving the country (Office of the Prime Minister, 2008).

The above issues need to be addressed and put into consideration if indeed biometric systems are to be implemented as a part of the solution in the management of complex human settlements.

2.4 Soft Systems Methodology

Soft Systems Methodology (SSM) is a result of the action research project of Prof. Peter Checkland and his colleagues conducted over thirty years ago in order to develop a methodology that would allow users to deal with the kind of problems that can be described as 'messy problem situations' as they lack a formal definition.

Action research combines theory and practice to help in practical problem solving. SSM encourages learning and understanding which hopefully will lead to agreed changes of the existing systems or resolution of the problems. SSM is a methodology which provides a window through which the complexity of human behaviour can be investigated and described (Checkland & Scholes, 1990).

SSM is often construed as a methodology for dealing with 'soft' problems i.e. problems that involve the psychological, social or cultural elements, while in actual sense, the methodology does not differentiate between 'hard' or 'soft' problems; it merely provides a different way of dealing with situations that are perceived to be problematic. The 'hardness' or 'softness' is not an intrinsic quality of the problem to be addressed, but rather, an aspect of the way those involved address the situation. Situations that tend to be complex or problematic and where those involved lack a common agreement on what constitutes the problem usually have different perspectives, values and beliefs which more often than not tend to be inter-related and changing one aspect tends to have a knock-on effect on the other aspects (Williams, 2005)

SSM as a methodology does not seek to solve the problem at hand but aims to facilitate a learning process through which all involved will develop a more comprehensive understanding of the problem from where, all the concerned stakeholders will be able to reach a consensus on the best way to go about solving the problem. Checkland and Scholes (1990) as well as Ngethe (2008) seem to agree that the most unique feature of SSM lies in its iterative process of problem diagnosis, action intervention, and the reflective learning both by the researcher and the participants in the process.

Soft computing has been described as an "emerging collection of methodologies which aims to exploit tolerance for imprecision, uncertainty and partial truth to achieve robustness, tractability, and total low cost". This methodology is strongly based on intuition or subjectivity and provides an attractive opportunity to represent the ambiguity

in human thinking with the real life uncertainty. The core methodologies for soft computing are fuzzy logic, neural networks, and genetic algorithms. Hard computing solutions are usually more straightforward to analyze, with their behaviour and stability more predictable; and the computational burden of algorithms is typically either low or moderate. These characteristics are particularly important in real-time applications. Thus, soft computing and hard computing should be seen as complementing methodologies. Both technologies are needed when developing high-performance, robust, and cost effective products in this demanding technological age (Seppo, Hugh, & Akimoto, 2002).

SSM uses models of human activity to explore with actors in the real world problem situation. It enables people to identify and come up with solutions to various problems that they may be facing especially where there are various goals, logics, divergent views and opinions which are all entangled hence it is difficult to identify the best way forward in solving the particular problem.

Not all researchers agree with the suitability of Checkland's SSM. The method has received criticism especially by authors who argue that novice users experience most difficulty in applying the methodology despite it having the seven step sequence. From the participant's point of view, Marcia (n.d) describes the main four weaknesses for SSM as noted below. First is the unnecessary polarization of the hard and soft thinking. Second is the limited theoretical foundation for creating social and political description and analysis of human systems. Thirdly is the little consideration of the basis for validating claims to the research findings, and finally the conflict of the structures and functions of managing, consulting and researching in human setting.

Ngethe (2008) in her thesis notes that the methodology's weakness on the researcher's point of view include: impartiality and lack of discipline in following the methodology as well as the 'mistaken for consulting rather than guiding the users into determining the problem at hand, the researcher assumes 'I know the problem' approach.

O'Brien (2000) also makes note that if the above happens and the developer is entangled in the consulting web and goes ahead to develop a system, then the final system is likely not to be accepted and if it is, the ownership component will be lacking as users' requirements were not taken into consideration.

2.5 Other Problem Structuring Methods (PSM) alternatives

The section below highlights some of the major soft Operations Research methodologies that do exist and have been put into use in coming up with solutions to situations that are considered to be messy in nature.

2.5.1. Strategic Options Development and Analysis (SODA)

This approach was developed by Professor Colin Eden in 1989 and is Soft OR method for working on complex problems/messy problems. It uses interview and cognitive mapping to capture individual views of an issue. Group maps constructed through the aggregation of individual cognitive maps are used to facilitate negotiation about value/goal systems, key strategic issues, and option portfolios. As well as problem content, attention is paid to the affective, political, and process dynamics in the group. It

is aimed at groups of four to ten participants and requires two facilitators to manage it as well as computers and special software (Jonathan, 1989).

2.5.2 Strategic Choice Approach (SCA)

This methodology is used in face to face workshops of a decision making group. It is a repetitive technique based on four basic principles. These are **shaping** which involves identifying the problem area, **designing** which tries to recognize what can be done as well as the possibilities and drawbacks, **comparing** the various ideas and evaluating the best way forward and finally **choosing** the best ideas for solving the problem (Friend & Hickling, 2005).

2.5.3 Drama Theory

Is a Problem Structuring Method of Operations Research based on game theory and adapts the use of games to complex organisational situations, accounting for emotional responses that can provoke irrational reactions and lead the players to re-define the game. In a drama, emotions trigger rationalizations that create changes in the game, and so change follows change until either all conflicts are resolved or action become necessary (Bryant, 2003).

2.6 Conclusion

Soft OR methodologies are valuable in terms of supporting problem structuring and finding alternatives in different stages of problem solving process. Critics of the approaches however make note of the underlying assumption that all the members of the enterprise have a choice. There is also the assumption that both managers and workers can openly discuss their problems at the work place. As much as steps have been developed on how to employ the methodologies, the process is not always straight

forward as some overlapping is likely to be encountered in defining and expressing of the problem (Masood & Shalini, 2008).

In an ideal situation and in order to be able to correctly capture users' requirements, both the soft OR approaches as well as the traditional strategic management tools should be used in a complementary manner rather than in conflict as O'Brien (2000) notes. If this approach is adopted, then the decision makers who mostly are the management team will have at their disposal efficient and structured ways of identifying and evaluating options. By this, focus is directed to people rather than the process alone and when this is done, the end result is an integration of knowledge and transparency as well as building of trust between the various different groups (Masood & Shalini, 2008).

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

M.I.S as a field is still developing with time and as a result, constantly experiencing rapid change and turmoil. Palvia, Mao, Salam, and Soliman (2003) discuss various methodologies highlighting their pros and cons. A researcher selects a methodology based on factors such as rigor, relevance, subject area, and personal preferences and for this research, qualitative research was chosen. Qualitative research involves the use of qualitative data, such as interviews, documents, and participant observation data, to understand and explain social phenomena while Quantitative research involves the use of survey methods, laboratory experiments, formal methods (e.g. econometrics) and numerical methods such as mathematical modeling to study natural phenomena. The three main types of research according to Palvia, Mao, Salam, and Soliman (2003) are:

3.1.1 Qualitative Research Paradigms

Various authors have expressed the different paradigms that make up qualitative research. Some from for four and others think that three paradigms are sufficient to discuss qualitative research as positivism and post-positivism can be classified together.

3.1.2 Positivists Research

The assumption here is that reality is objectively given and can be described by measurable properties which are independent of the observer (researcher) and his or her instruments. Positivist studies generally attempt to test theory, in an attempt to increase the predictive understanding of phenomena.

3.1.3 Interpretive Research

Interpretive researchers start out with the assumption that access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings. The philosophical base of interpretive research is hermeneutics and phenomenology.

3.1.4 Critical Research

The assumption here is that social reality is historically constituted and that it is produced and reproduced by people. Critical researchers recognize people's ability to change, although it is constrained by various forms of social, cultural and political domination and has a focus on the oppositions, conflicts and contradictions in contemporary society.

3.2 Research Design

This research used a case study design approach. This method allows for an in depth study of the particular situation. A case study enables for narrowing down of a broad field of research into easily researchable topics and is useful for trying to test theoretical models by using them in real world situations. "A case study gives an opportunity to test whether scientific theories and models actually work in the real world" (Shuttleworth, 2008).

An advantage of using a case study approach is that it results into more realistic responses than a purely statistical survey, although some arguments against it have also been put across that since a case study is specific, its findings cannot be extrapolated to fit an entire population. A case study approach is flexible and can introduce new and unexpected results in its course unlike other methods which are employed to prove or disapprove a certain research hypothesis.

Due to the nature of the study where both 'soft' and 'hard' issues of the project were analysed, including the behavioural, political, and cultural aspects of the various stakeholders and proposed users of the system. Soft System methodology as was developed by Checkland was adopted as the research methodology for this study.

3.3 Choice of Case Study

Dadaab refugee camp is located in the Northern part of the country which is considered a remote area by many people due to factors such as the harsh weather conditions, distance and the poor infrastructure in the region. Not much attention is given to the region despite it hosting the world's largest refugee camp in the world and so much resources being directed in the area for the support of the refugee operation. The study will explore on the proposed biometric system implementation as well as expectations that may or may not be met from its implementation and any other opportunities that can arise from implementation of the biometric system.

3.4 Data Collection

The study used a participatory approach where the stakeholders, UNHCR, WFP and GoK at the Dadaab camp as well as Nairobi based programme heads, were engaged in roundtable discussions. Both technical (those with I.T knowledge and experience) and non-technical staff (novice persons in terms of I.I related issues) but are involved in distributions as well as registration process reviewed the biometrics project's background, the current progress so far and gave their recommendations on the way forward regarding the registration, distribution and overall camp management.

Stakeholders went through the seven stages of SSM as was prescribed by (Checkland & Scholes, 1990).

Stage 1: Involved acknowledging and defining the problem situation. An assessment of the interest area was conducted to determine the systems key processes and players.

Stage 2 Rich pictures were used to express the above situation in all its richness i.e. the structures, issues expressed by the people, environment, and conflicts. Indeed as it is said, 'a picture is worth a thousand words'.

Stage 3: Root definitions were constructed to help move from the 'real' world into the world of systems. The first step was to understand the concept of different perspectives that were possible to draw out of the rich picture. These are defined as holons i.e. "plausible relevant purposeful perspectives that can describe the real world activities". Each holon provided a separate value base by which to evaluate the situation.

Checkland's mnemonic CATWOE was used to aid with the above structured development process. The order to follow when constructing the CATWOE in order to have a logical flow is: Transformation, Weltanschauung, Customer, Actor, Owner and Environment

Actor: They facilitate the transformation to the customers.

Transformation process: This shows the conversion of inputs into outputs i.e. from start to finish.

Weltanschauung: This is a German term used to refer to 'worldview'. This is what gives the transformation process some meaning.

Owner: This is the person whom the system is answerable to; he has the power to start up, shut down or cause the system not to exist.

Environment: These are the external elements outside the system. They influence but do not control the systems performance.

Stage 4: Involved developing the model. From the root definition, conceptual models were developed using systems conventions. Checkland recommends the below process especially for beginners:

Firstly, write down the activities necessary to carry out the transformation.

Secondly, select all the activities that can be done at once.

Thirdly, place the above activities in a line, and then followed by those that are dependent on the first one. Continue until all are accounted for.

Fourthly, indicate the dependencies.

Fifthly, rearrange to avoid overlapping arrows where possible.

Lastly at this stage, ensure the system demonstrates properties which include: a mission, measure of accessing performance, a decision making process, components that interact with each other and should be bounded from the wider system (environment) which may be closed or open, resources should be available at its disposal at the end of the decision making process and continuity, or the ability to recover in the event of a disturbance.

Stage 5: The model was then compared to the real world. The results from step four and two were compared to establish any similarities or differences.

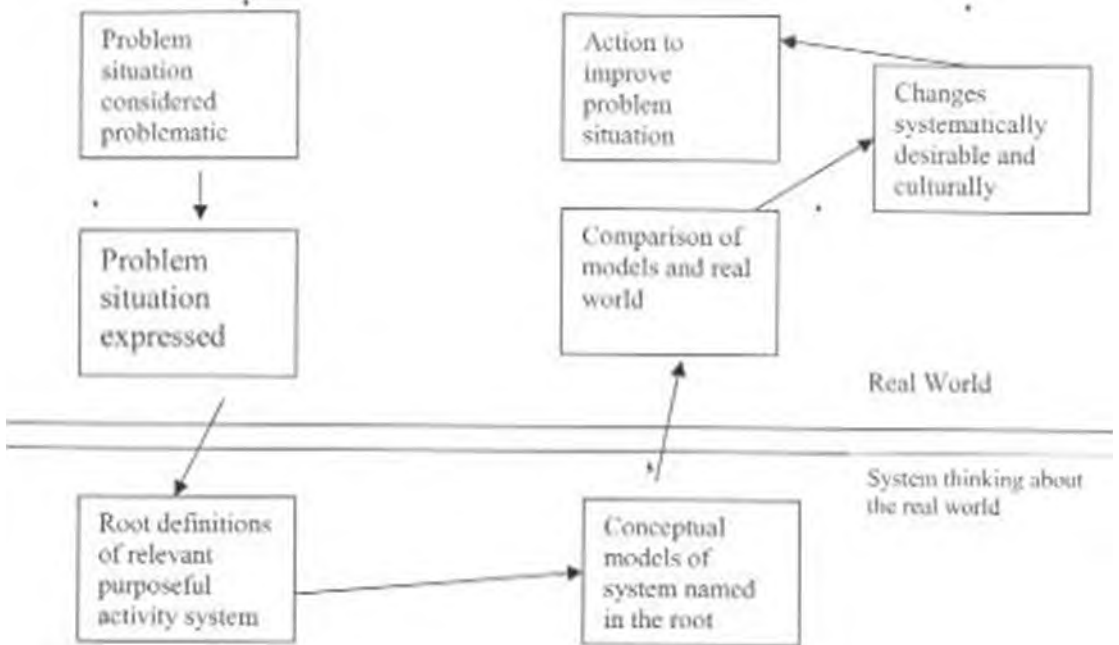
Stage 6: Involved identifying feasible and desirable changes in order to find possible ways of improving the situation.

Stage 7: Will involve looking into what actions can be taken to improve the situation as it was previously established. A whole new SSM cycle can now begin after this stage.

3.5 Data Analysis

At the end of the participatory discussions which included clarification sessions with some individuals in order to shed more light on the areas that were gray at the time, the findings and more so the requirements were then be compared to the ongoing system development. Other opportunities that could be achieved from the implementation of the biometric technology were be examined and their feasibility conducted in a bid to establish whether the technologies could be rolled out in the camp presently and if not, to establish the short comings that would need to be tackled for the technologies to be rolled out.

The diagram below represents the steps described above:



Adopted from Williams (2005)

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The study sought to undertake requirements engineering in a camp setting by using a qualitative research method and in particular SSM. This method provides for a participatory approach in determining system requirements as well as it was easy to learn and was the most structured as compared to other soft approaches.

4.2 Data Collection and Group Discussions

Programme and logistics staff from the two lead agencies, WFP and UNHCR as well as GoK staff involved in the verification exercise gathered together at the camp over a weekend as this was the most appropriate time for most staff when there are no other activities going on at the camp. They were able to give their views on the proposed biometric system to be used in accurately capturing and correctly identifying all the refugees that were being hosted in the camp. In addition to giving their views on the proposed biometric system, the forum was turned into a brain storming session where other technological uses and opportunities resulting from the use of the biometric system were identified and their usage explored in the camp setting as a means to managing the camps more efficiently.

Follow up interviews to clarify issues with some of the key individuals and more so the respective program managers who were not able to be at the camp on that particular time was done as well as reviewing of documents from other camps settings elsewhere in the world where similar technology had been introduced. This was in a bid to identify areas of improvements in the current system adoption as well as the pitfall to avoid in the implementation of the system.

The researcher started by giving a brief introduction of the purpose of the gathering and the expectations and immediately after, the ideas and discussions started flowing after posing of the questions as per the interview guide. Much time was spent taking short notes from all who gave their views which were later compiled to come up with a final report. The only other time when the researcher addressed the gathering was when he was explaining the SSM model and how it works.

4.3 Data Analysis and Findings

4.3.1 SSM Stage 1 and 2

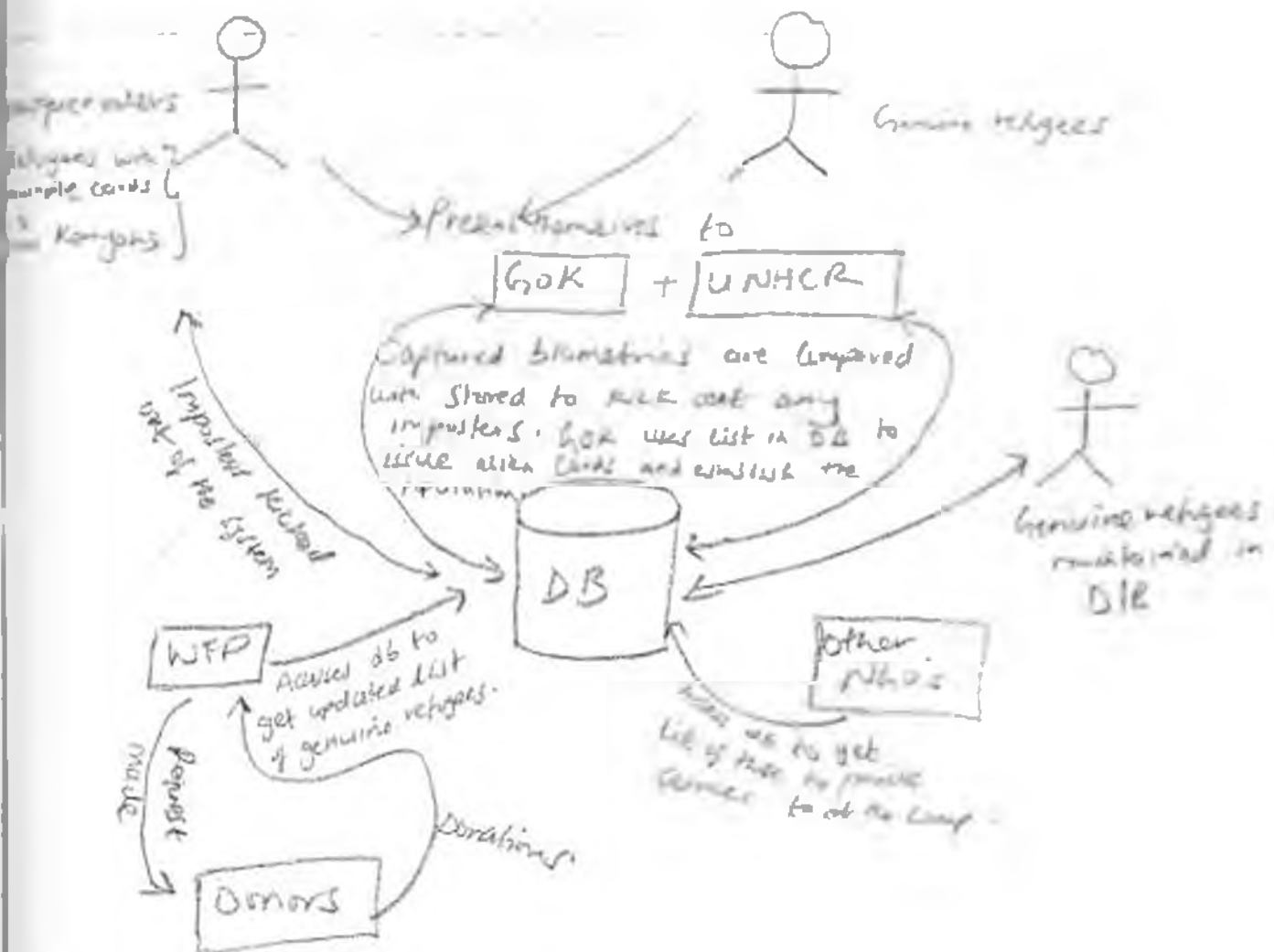
A description of the current refugee arrival, registration, card issuance, food collection and consumption was given and expressed using rich pictures. (Diagram 4.1). From the diagram, it was apparent that there exists a problem with the current manual system as there is not much control over who collects the food. This loophole in the system makes it possible for crafty refugees and local Kenyans to take advantage and benefit from the food aid.

Food aid received is utilized differently by beneficiaries, who consume it differently. Some of the food issued ends up being sold in the markets for various reasons including. Sale by individuals who possess multiple cards and are in need of money to purchase other items (food and non-food). Others sell the food as they consider some of the received food commodities not to be culturally acceptable (example sale of corn meal which is less preferred as compared to wheat flour). Others and mostly those with animals, (camels, goats and donkeys) end up feeding their animals with part of the food in order for the animals to survive as there are no grazing areas in and around the camp.

Diagram 4.1)



The proposed biometric system was agreeable to all as part of the solution to the problem of registration and identification. All the organizations working at the camp will benefit from accessing the centralised database where the refugees' biometrics would be stored and hence streamlining of services which are rendered as highlighted using the below diagram. (Diagram 4.2)



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The above diagrams assisted the team to better visualise the problem statement, the proposed solution as well as other challenges resulting from the adoption of the new technology.

4.3.2 SSM stage 3

This stage involved coming up with systems root definition. All the Customers, Actors, Worldview, Transformations, Owners and Environment were identified. Checkland's mnemonic CATWOE was used to aid the users in remembering and ensuring that all the components were factored in.

Root definition 1

A system to uniquely register and identify all the refugees who are hosted at the camp and facilitate provision of services from all the agencies providing various services at the camp in accordance with the set regulations.

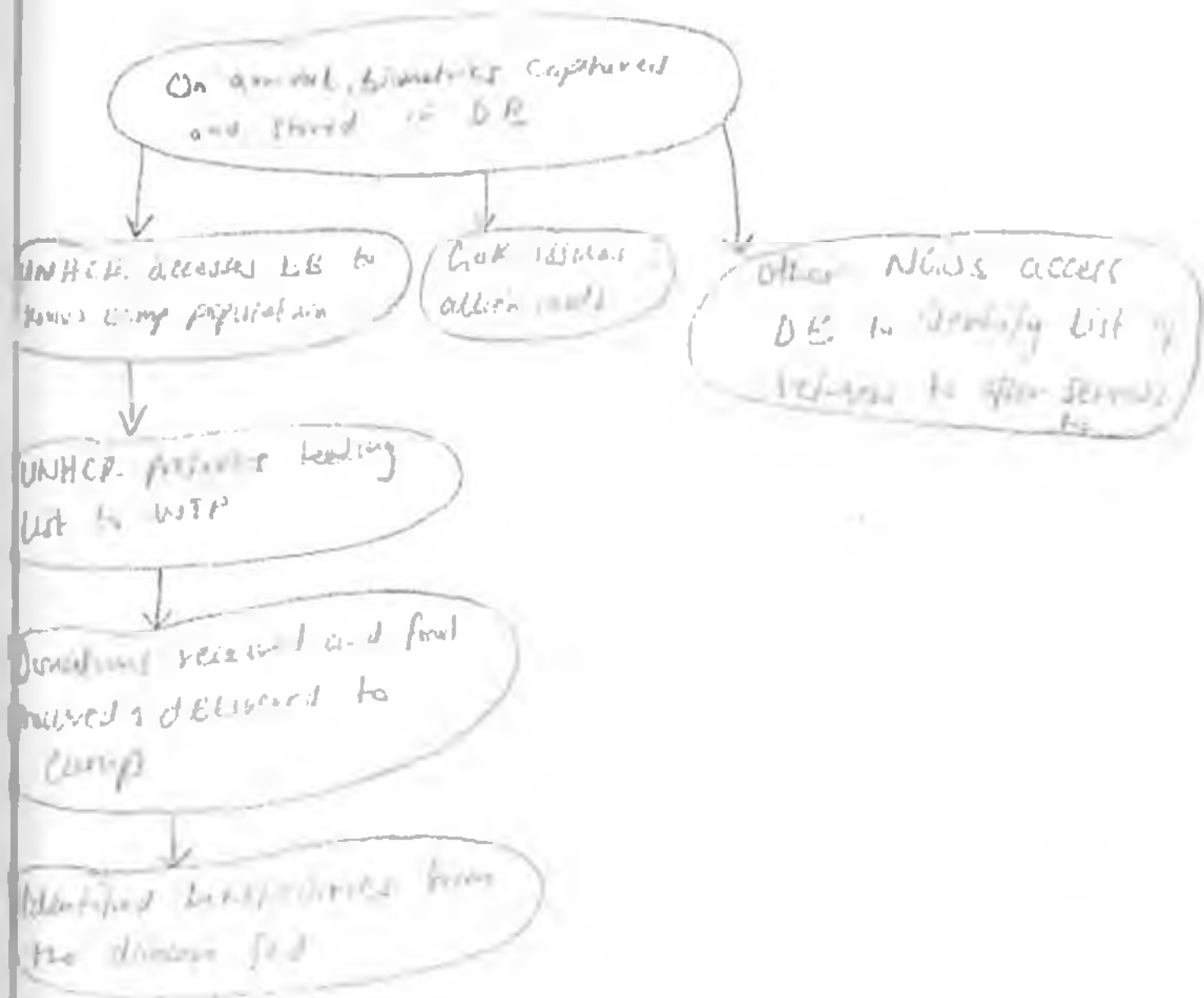
CATWOE ANALYSIS

- C** Refugees
- A** UNHCR staff, GoK staff
- T** Collecting and storing beneficiaries biometrics to replace the current use of a ration card.
- W** Technological advances to uniquely identify individuals
- O** UNHCR, GoK
- E** Establishing the right system for use in the harsh environment

4.3.3 SSM stage 4

During this stage, conceptual model of the root definition was then developed. The conceptual model describes the activities that must be carried out in order to achieve the desired transformation. The basis of the conceptual model is thus the root definitions and not necessarily that which is going on in the real world.

Figure 4.3 Conceptual Model Root Definition I



4.3.4 SSM stage 5

Registration Process

The main purpose of the biometric system is the refugee registration process and has the intention of ensuring that only legitimate refugees are recognized. Currently the registration process is being carried out by the UNHCR on behalf of the Department of Refugees Affairs - Government of Kenya. Refugee verification exercise is currently underway to ensure that all those claiming to be refugees present themselves at designated points within the camp to have their details registered in a database.

Food distribution process

All the participants were in agreement that with the advanced technology provided for by the biometric system, there existed other opportunities that could be explored with regards to alternative modalities of the physical distribution of food at the camp. Processes such as procurement, loading, transport and warehousing of the physical food commodities was considered expensive especially due to the fact the food commodities were imports being received at the county's port of Mombasa which is over 500 kilometres away.

Cash and voucher programming which is a new system of food aid distribution could work well in a situation where such a system which uniquely identifies individuals has been put up. These technologies have been established in a bid to reduce the hustles associated with the physical food distribution as well as curbing on practices such as food sale for cultural reasons or for monetary gain. Cash transfers offer greater flexibility and allow beneficiaries to purchase food wherever they choose at advantageous prices. Cash

is transferred to beneficiary's bank accounts who then access the amount to purchase food at their preferred outlets. This mode is preferred where the main aim is to provide income transfer but suffers mostly from abuse for non-food purchases. Vouchers on the other hand involve the beneficiaries receiving tokens which they can exchange for food commodities at identified outlets. They come in handy when the overall purpose is to improve nutrition and hence ensure that the vouchers are exchanged for highly fortified commodities that have been supplied at the identified outlets.

Both cash and vouchers provide for a similar market based approach and give the beneficiaries purchasing power. They help to inject liquidity and stability in the local economy and their use is mostly appropriate during or right after harvest. Both are efficient as they offer a considerable saving on transport and handling of physical food commodities. They help to stop desperate coping strategies such as begging and pulling children out of school in order to work and buy food for the family.

4.3.5 SSM stage 6

This involved a careful analysis and identification of systematically desirable and culturally feasible changes in order to find possible ways of improving the situation.

Registration process

Capturing of the biometrics at the point of arrival will solve the problem of double registration as well as impersonation by the local host community in order to benefit from food aid. The ongoing verification exercise makes this presently feasible.

Food distribution process

Once the registration process is automated, other modalities of food distribution such as the cash and vouchers can be explored as they are pegged on modern biometric technology. Major savings in-terms of transport would be made as physical food will no longer be transported all the way from the port of Mombasa, (transport cost includes insurance and security escort to ensure that the food is received intact). Savings would be made on food storage cost which includes (warehousing, fumigation and site security for the food). The current practice of food sale of the culturally unaccepted foods sale will be no more hence saving on the total amount received from the donors. With the refugees having the purchasing power, there will be increased injection of money into the local economy and hence the host community living in the area will benefit from doing legitimate business with the refugees. All the above are desirable aspects of a food distribution process which is based on the cash and vouchers.

The food distribution process relies on the use of printed word documents printouts which have details of the issued card eligible for food collection. These printouts are referred to as the manifest. The manifest is manually ticked while the ration card is punched off as evidence that the card number in question has been used to collect food in that particular cycle at the exit point. It was evident that not all card numbers in the manifest were genuinely acquired and in some cases, the some of the owners listed could have left the camp due to successful repatriation to other countries, movement from the camp in search of medical attention or even death. Some locals in the region have registered as refugees and thus possess the ration cards which enable them to benefit from

the food aid and thus the mere indication of a ticked manifest is not proof enough that the food aid was received by the intended person.

For the cash and vouchers to replace the current food distribution process, the following factors need to be present and available: Markets that are functioning well in terms of demand and supply factors as well as the market's distance need to be close by to ensure short distance both for the suppliers and those purchasing. Currently due to the long distance, bad roads and insecurity in the area, such are non-existent and thus idea is not presently feasible though desirable. This distribution modality also requires financial institutions and organizations with the capacity to roll out the cash and distribute the voucher. The banks, micro-finance institutions and voucher printing facilities are all lacking in the area as well as the expertise and experience to roll out the same thus presently this is not feasible.

Concerted efforts of convincing the donors to give their contributions in cash as opposed to the in kind donations will also be needed. Some of donors provide the in kind donations as they could have produced a surplus in their countries and as a way of disposing the surplus, it is given out in form of donations. Much effort will be required to convince them to give cash instead which is not feasible as they too have their own needs that they need to take care off. This makes the idea not to be feasible at the moment. Another major challenge related to the introduction of the vouchers touches on employment. Job opportunities associated with the physical handling of food in the case of the implementing partners as well as monitoring and evaluation for the UN staff whose duty include distribution, monitoring and evaluation of the distribution process would be

reduced as physical food would no longer be issued. This would call for a deployment of some staff while to some it would mean the end of their jobs as their services will no longer be required. This will create some discontent within the staff as well as local host community members who in some way work at the distribution centres (e.g. offloading the food commodities from the trucks) thus making the process not to be presently feasible or desirable.

4.3.6 SSM stage 7

This dealt with the recommendations for taking corrective action to solve the current problem. All were in agreement that the biometrics system would solve the current registration and verification problem at the camp. It would also help to monitor new arrivals as well as accurately determine the present camp population.

As for the cash and vouchers, this mode of food distribution was currently not viable due to the identified present constraints in step 6. However, the method would prove to be ideal if the identified challenges were addressed and the technology adopted in future due to its associated benefits.

4.4 Discussion

The Soft approach techniques as an alternative to the traditional methods of requirements elicitation are gaining acceptance in today's world. Pursuing to the discovery of the SSM technique by Checkland in the 70's various other scholars have come forth and researched into other similar techniques such as the strategic choice approach, Strategic Options Development and Analysis, ethics and drama theory all which are qualitative techniques for problem solving.

The main strengths of the methods lie in the ability to use the participant's observation data and interviews in finding out their feeling and thoughts over proposed changes. These factors contribute to delivery of systems whose chances of acceptance as well as ownership of the same are relatively higher as compared to when traditional methods are employed (Palvia, Mao, Salam, & Soliman, 2003).

The modern trend is to be able to use both the soft OR approaches as well as the traditional strategic management tools in a complementary manner rather than in conflict. When both the developer and users are able to interact and discuss on the desired changes in an open approach, important components which will greatly affect the implementation of the system will be identified early in the process. More often, these factors do not relate to the technical specifications and thus if both approach are employed, chances of missing out the problem are minimized (Masood & Shalini, 2008)

SSM was used for the study for the main reasons in that for one, it does not require any specialized equipment to undertake, just time, a pen and paper. Other methodologies such as the Strategic Choice Approach and the Strategic Options Development and Analysis may require the use of computers as well as specialized software. Secondly SSM is a well structured methodology which guides the users on what is required in every step. This makes it easy to use and learn although some researchers such as Marcia (n.d) have criticized the method for being difficult to implement especially for beginners. The use of the approach assisted in a great way in meeting the objectives of this study among them highlighting opportunities that may arise from the implementation of the biometric system at the camp.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

This chapter discusses the conclusions of the study in line with the objective which was to undertake requirements engineering for a biometric system in a camp setting using Soft Systems Methodology and by extension, be able to identify other opportunities that may arise from the implementation of the proposed system in camp management.

The study also sought to compare the SSM proposals versus the current biometric system highlighting what is currently systematically and culturally feasible as a present day solution to the running and management of the camp.

5.2 Conclusion

From the study, it is clear that the biometric system will greatly transform the registration and identification procedures for refugees in the camp. The exact numbers will be accurately identified and movement of the refugees within the camp monitored. The system will also monitor cross boarder movements which will enhance the security as people on a watch list will find it difficult to enter the country.

Using SSM, cash and voucher technology which would revolutionize the food distribution process and bring tremendous changes to the region as a whole was identified. The cash and voucher technology however would currently be impossible to implement at the camp due to the main challenges that have been highlighted earlier in chapter four. Much more time and repeated study on the same needs to be done to ensure

that no factors are left out as this would be a very big project having major implications as also highlighted earlier

5.3 Recommendations

1. The government should hasten the verification exercise which will see to it that all the people residing at the camp have had their biometrics stored in the centralized database.
2. More research of the appropriate biometric technology should be done as well researching into ethical issues pertaining use of biometric technology. This is because the refugees will not have a choice or option on the usage of the technology as all services rendered at the camp will be based on this technology.

5.4 Limitations of the study

Some of the participants, especially from GoK, did not have the morale for the sessions which were conducted on a weekend. There was no incentive for them on the weekend which they considered be their resting time. The only reason why they turned up was due to the respect for the camp based colleagues and the fact that since the area is an insecurity zone, collaboration is one of the techniques to survive in such an environment. The GoK staff had the feeling that their mandate ends at the registration point and issues to do with food distributions did not touch on them.

Just as Ngethe (2008) did note in her research, results from such a study are mostly influenced by the researcher who despite having the consultative sessions with the clients, he will be the one to draw up the final report. Also during the sessions, the researcher sometimes does not follow the interview guide and as a result the process

becomes a session to rubber stamp what he had thought was the problem rather than getting it from the audience.

SSM methodology requires much time to be able to undertake. This was not sufficiently available as people are usually busy with their routine duties. With just one weekend that was available, the sessions were rushed in order to ensure that the researcher got as much as possible within the shortest time. Compiling of the final report was left to the researcher.

5.5 Suggestions for future research

SSM methodology requires much time to be able to undertake. Based on the availability of time and depending on the magnitude of the project, the proposed model can further be refined using the SSM model to be able to capture any factors that may have been left out or not correctly captured in the first sessions.

Other soft approaches can also be employed at the camp environment to see if they will yield similar results as the SSM

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APPENDICES

Appendix 1: Letter of Introduction

Dear Sir Madam,

RE: MAINGI SAMUEL REG NO D61/8782/2006

The above named is a post graduate student at the university of Nairobi. In order to complete his course, he is required to carry out a research study and he has selected "Requirements Engineering for a Biometric Based Registration and Identification System in refugee Camp Management: Case Study of the Dadaab Refugee Camp." as his research topic.

Any assistant accorded to him to enable him complete his study will be highly appreciated.

Thanking you in advance,

Yours faithfully,

Maingi Samuel

D61/8782/2006

STUDENT

DR. James M. Njihia

SUPERVISOR

Appendix 2: Interview guide

1. Describe the current activities related to registration that new asylum seekers and refugees undergo upon arrival at the camp.
2. What are the main weaknesses of the current system?
3. Do you think whether the proposed system will be a solution to the above problems?
4. Upon implementation of the biometric system, what other technologies can be adapted to be used in the food distribution systems?