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A decision enhancement studio for starting a miners enterprise in Uganda

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HABINKA ANNABELLA DOROTHY BASAZA

**A Decision Enhancement Studio
for Starting a Miners Enterprise in Uganda**

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Habinka Annabella Dorothy Basaza

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for Starting a Miners Enterprise in Uganda

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To Mum, Dad, Curtis and Joy

Preface and acknowledgement

In today's world, Small and Medium Enterprises (SMEs) are becoming increasingly interested in using Information and Communication Technology (ICT) to facilitate start-ups in the ever-changing environment. The failure rate of start-up firms seems to remain high due to the lack of adequate agile decision services. An important challenge SMEs need to meet is to find ways to support the start-up decision process among stakeholders in a distributed environment in particular in transition countries. In this study, we identified enterprise start-up issues in mining SMEs in Uganda. The research developed and evaluated a studio for enhancing mining enterprise start-ups in Uganda. This helps to facilitate the mining knowledge service centers in their enterprise start-up role in Uganda and countries with similar contexts.

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Habinka Annabella Dorothy Basaza

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CHAPTER 1. SME START-UP AND ICT

While start-up enterprises create a substantial economic impact on most economies, the failure rate of start-up firms seems to remain high due to inadequate agile decision services. Deciding to start-up small and medium enterprises (SME) is a challenging task in Uganda. Technology is envisaged to facilitate enterprise start-ups. However, there is still acknowledged deficiency in Uganda due to complexity interaction of technology, processes and stakeholders in a human context. There is lack of a generalized and systematic means to SME start-up that emphasizes communication and prioritization. In this research, we noted the importance of improving enterprise start-up decision process in Uganda. Hence, this research aims to enhance SME start-up processes with a decision enhancement studio which consists of services for participants in an interactive environment that analyzes decision alternatives. This research contributes a set of design artifacts that are used to gain insight into the enterprise start-up decision process and its support with information and communication technology (ICT). In this chapter, we provide an introduction to this research by looking at the SME start-up initiatives, the role of ICT in SME start-ups, the challenges of SME start-ups then present a general summary of the approach we used and the outline of this thesis.

1.1 SME start-up initiatives

Small and Medium Enterprises (SMEs) have been a subject of socio-economic interest with the spread of globalization and capitalism (Gielnik, 2010; Acs & Kallas, 2008; Kunene, 2008; Kiggundu, 2002). The contribution of the SME sector to economic growth has been widely acknowledged due to their impact on Gross Domestic Product (GDP), job creation and, socio-economic transformation (Gielnik, 2010; Acs & Varga, 2008; Okello-Obura, 2007). In addition, SMEs are engines of wealth creation, innovation, technology transfer, and development of skills (Ishengoma & Kappel, 2008; Chiware, 2008; Gibbon, 2004; White, Gibson, Hakemulder, & Tewari, 1998).

According to the Organization for Economic Cooperation and Development (OECD) about 95% of enterprises are SMEs, employing between 60% to 70% of the total workforce (OECD, 2010). In Uganda, there are an estimated 1.5 million SMEs contributing to 20% of the GDP with more than 90% of them in the private sector (Kiwauka, 2011; Walugembe, 2010; Kato, 2010).

Progress reports on the Millennium Development Goals (MDGs) for Uganda show that the country has made advancement towards achieving MDG 1 that is (reducing the share of the population that lives in poverty by 2015) (UMFPED, 2010; PEAP, 2003; MDG, 2003). In Uganda, poverty eradication is one of the major aims of the government in the drive to transform the economy (Gielnik, 2010; Walter et al., 2005). Emphasis is placed on private investment, which acts as the major source of employment for an estimated 12 million workers (PSFU, 2011). Although there are no accurate employment figures in Uganda, it is estimated that annually about 300 thousand new job seekers are absorbed by the informal private sector (PSFU, 2011). The accelerated growth of SMEs, together with greater mobility from informal to formal status, has the potential to reduce poverty, in particular income through expanded and more productive employment (PSFU, 2011).

According to Hinton et al., (2009) an estimated 1 million Ugandans directly benefit from more than 150 thousand mining SMEs. The growth in mining and quarrying activities is estimated to 15.8% which represents 1% increase in industry and production sector from 6.5% in 2010 to 7.5% in 2011 according to the national 2011 Budget (Kiwauka, 2011). This growth is attributed to the discovery of petroleum in Uganda as there is a rush into the mining sector (DGSM, 2011; Kiwanuka, 2011).

Uganda's national economic agenda "Vision 2035" prioritizes SME start-up initiatives (CWS, 2007). The objective of this program is to transform the SME sector to become the primary foundation of the country's industrialization and poverty alleviation programmes (Ssebugwawo, 2007; Ssewanyana and Busler, 2007; Walter et al., 2004). "Vision 2035" envisages achieving the following objectives by 2035 (CWS, 2007):

- Four million SMEs to be operational,
- SMEs to contribute 40% towards GDP,
- SMEs to provide employment to five million people,
- SMEs to contribute 40% to the export earnings,
- 40% of the SMEs to be involved in manufacturing activities,
- 50% of SMEs to be owned by women,
- 5% of SMEs to be involved in agriculture with a survival rate of at least five years.

Bayene (2002) claims there is no universally accepted definition of SMEs in Africa and notes that definitions in other countries lack uniformity and reflect the relative development of their respective economies. SMEs are widely defined in terms of their characteristics which include: size of capital investment, number of employees, turnover, management style, location and market shares (Okello-Obura, Minishi-Mayanja, Cloete, & Ikoja-Odongo, 2008; Kasekende & Opondo, 2003). In Uganda, SMEs are commonly defined as:

- *Small Enterprises*

These employ a maximum of 50 people, annual sales/revenue turnover of a maximum of 360 million Uganda Shillings (UGX), and total assets of maximum 360 million UGX.

- *Medium Enterprises*

These employ more than 50 people with a maximum of 500 people; annual sales/revenue turnover of more than 360 million UGX and total assets of more than 360 million UGX (UIA, 2008; Hivos, 2008; Kasekende & Opondo, 2003).

An *entrepreneur* is a risk taker who sees an opportunity in the market, gathers resources, creates, grows a business venture to satisfy these needs and is rewarded with profit (Kunene, 2008). Schumpeter, (1934) defines an entrepreneur as a person who destroys the existing economic order by introducing new products and services, creates new forms of organization, or exploits new raw materials. According to GEM (2007) enterprise *start-up* is any attempt by individuals to start a new firm including effort for self employment. The process of moving from conventional labour to the entrepreneur pool is also known as enterprise start-up (Wickham, 2001). Starting up an enterprise is viewed as a decision or choice a manager makes to start a business venture (Townsend, Businetz, & Aurthurs, 2010; Wickham, 2001). It is important to note that these definitions emphasize start-up as a process with a purpose. Therefore, enterprise start-up is a process that is gradual and takes time and resources to move through this phase. The common purpose of starting an enterprise is to add value or make a profit.

Enterprise start-up is concerned with learning and understanding the needs of the stakeholders with an aim of communicating these requirements and findings for decision making (Kunene, 2008; Wickham, 2001). A review of entrepreneurship initiatives in Uganda shows that the three institutions spearheading the creation of SMEs are Uganda Investment Authority (UIA); Private Sector Foundation

Uganda (PSFU), and Enterprise Uganda (EUg). These institutions objective is to provide information to entrepreneurs acting as one-stop shops (UIA, 2011; PSFU, 2011; Enterprise Uganda, 2011).

Despite the importance of SMEs in a national economy, the success and failure of business activities is greatly attributed to the level at which information is accessed, handled and utilized (Okello-Obura et al., 2008; UBOS, 2007; Walter et al., 2005; Ikoja-Odongo, 2002). It is therefore essential that business information be provided in a timely manner to SME entrepreneurs to enable them make start-up decisions (Qureshi, Kamal, & Keen, 2009). The foundation of any business is critical to its sustainability and operation (Okello-Obura, Minishi-Mayanja, Cloete, & Ikoja-Odongo, 2009).

In Uganda, more than 30% of the SME start-ups do not survive the first year due to limited access to information, lack of appropriate technologies, prioritization, and inadequate opportunities to support technology transfer (Walugembe, 2010; PSFU, 2010; Hatega, 2007). Their survival is greatly influenced by the amount of information availed to the SME stakeholders (Okello-Obura et al., 2009). To achieve a sustainable enterprise start-up, it is important for one to understand the start-up process and activities involved so as to establish what is required and the development of the right strategy.

1.2 The role of ICT in SME start-ups

There is evidence to suggest that use of Information Communication and Technology (ICT) can play an important role on the growth of SMEs (Qureshi, Kamal, & Wolcott, 2009; Matthews, 2007; Qureshi, 2005). Previous research has shown that SMEs that adopt technology have the potential to grow exponentially (Qureshi et al., 2009). Qureshi (2005) identified the ways in which ICT brings about development. A study carried out in Botswana rural SMEs showed that ICT enable information, knowledge for both social and economic development (Duncombe & Heeks, 2003).

The Ugandan government has turned to ICT as an enabler to improve access to information for social and economic change (UMFPED, 2010). ICT has received global UN support to all African countries, this is in line with Uganda's MDG's and Poverty Eradication Action Plan (PEAP) goals 2015 "*eradicating extreme poverty and hunger*" (Acs & Kallas, 2008; MDG, 2003; PEAP, 2003). Annan (2001) persuades African leaders to take advantage and participate in the information society as the only way for Africa to leap frog into the future.

ICT is an enabler to the transformation of the SME sector (Qureshi, 2005). Access to information is critical for empowerment and poverty eradication (UMFPED, 2010; Okello-Obura et al., 2009; Qureshi & Davis, 2007). Informed citizens are better equipped to take advantage of opportunities, access services, exercise their rights, negotiate effectively, and hold state and non-state actors accountable (WBG, 2011; Acs & Kallas, 2008). Most investment and institutional reform projects whether at the community level, national or global level, underestimate the need for information and under-invest in information disclosure and dissemination (WBG, 2011). ICT plays important roles in connecting poor people to information about rules and rights to basic government services, state and private sector performance, financial services, new markets, and prices, as well as to each other and to the larger society (WBG, 2011; Walter et al., 2005; Qureshi, 2005; Duncombe & Heeks, 2003).

ICT can be used in improving decision making especially by availing the necessary information services to support start-up decision process problems. Dissemination of unfragmented information can be eliminated as complete information is availed to the SME managers. Access to legalization information and documentation is made easier, especially for those operating in rural areas (Okello-Obura et al., 2009). SME business owners that lack clear information on the available funding institutions and procedures could make use of ICT to access such services. ICT provides for improved communication among stakeholders since information regarding the service providers and consumers upcoming activities like exhibitions, funding, competitions, trainings, workshops and seminar information is readily available (Walter et al., 2004). Archives with similar information can be availed timely to enable quick decision processes. ICT can also be used to reduce on the bureaucratic procedures involved in getting SME start-up information and procedures (Ssewanyana, 2007). In developing economies, few SMEs use ICT due to limited resources and lack of prioritization (Ssewanyana, 2007; Walter et al., 2005). However due to increasing competition, the Internet has proved to be a suitable means of sharing information, and communication. Drucker (1993) emphasizes that for the economy to move into a knowledge economy, a phenomenon of combining both the traditional and the modern economy into one economy fusion process must use the Internet as a suitable platform. According to the World Internet Usage and Population Statistics (2011), the Internet continues to increase the gap between the rich and poor continents as indicated by its world wide usage: Asia 44.8%, Europe 22.1%, North America 12%, Latin America/Caribbean 10.4%, Africa 6.2%, Middle East 3.4%, and Oceania/Australia 1.1%. As SMEs align ICT and business strategies an

increase in the firms performance can be realized (Ismail & King, 2007). Support to SMEs has become a key priority for the banking sector in effort to realize e-business services for example; the European Investment Bank (EIB) group facilitates loans for ICT investments with an aim of increasing value to its beneficiaries (EIB, 2008; EC, 2008).

1.3 Challenges of SME start-ups

Uganda is found in Sub-Saharan Africa with almost 35 million inhabitants (Central Intelligence Agency, 2011). According to the World Bank's annual ranking in "doing business" out of the 183 world economies, Uganda takes on an overall 123rd position (World Bank, 2012). This compares to 119th out of 183 world economies in 2011, 112th out of 183 world economies in 2010 and 111th out of 181 world economies in 2009 (World Bank, 2011). This shows that there is a need to focus on enterprise start-ups. Table 1-1 indicates the ranking of Uganda in the world economies from 2008 to 2012 based on main indicators in the World Bank (2012) report. The table illustrates growing complexity in starting up an enterprise in Uganda.

Table 1-1: Ranking of Uganda in the World Economies

Factors ranked	2012 (Out of 183)	2011 (Out of 183)	2010 (Out of 183)	2009 (Out of 181)	2008 (Out of 179)
Ease of doing business	123	119	129	111	105
Starting a Business	143	136	132	129	
Dealing with construction permits	109	108	132	-	
Registering Property	127	155	150	167	
Getting Credit	48	45	109	109	
Protecting Investors	133	131	131	126	
Paying taxes	93	68	63	-	
Trading across borders	158	157	147	-	
Enforcing contracts	116	113	116	117	
Closing a business	63	58	53	51	

Source: (World Bank, 2012)

SMEs in Uganda face a number of challenges which are classified in five categories: Social, Technological, Economic, Ecological and Political (STEEP) (Kato, 2010; Hinton et al., 2009; Wanger, 2007; Fleisher & Bensoussan, 2003). UBOS (2007) elaborates that the lack of complete information and ignorance on procedures are part of the STEEP multi-faceted problems faced by the SMEs in Uganda.

- *Social*

This refers to the challenges of the society or community in which the SME is embedded. These include demographics, cultural attitudes, literacy, level of education, customs, values and beliefs, life style and age distribution (Wanger, 2007; Walter et al., 2005; Fleisher & Bensoussan, 2003). It also looks at aspects such as geographical distribution and mobility of the population which contributes to the social component of the community.

- *Technological*

The technological aspects examine the advances in science and technology and the impacts of these advances on the business environment (Wanger, 2007). Technological advances impact the way SMEs manufacture products by utilizing new procedures and equipment. The technological aspect in mining SMEs affects procedures from the acquisition of raw materials right through to the repair and recovery of the product after its use by consumers (Walter et al., 2005; Fleisher & Bensoussan, 2003). The mining SME sector in Uganda lacks simple, affordable, appropriate local technology to increase mineral recovery while at the same time benefiting to the environment (Kato, 2010; Walugembe, 2010; Hinton et al., 2009; Walter et al., 2004). Other technological challenges include: infrastructure, reliability, affordability, lack of skills and knowledge on technical know how (Qureshi, Kamal, & Wolcott 2008; Kapurubandara & Lawson, 2007).

- *Economic*

SMEs in Uganda face problems of high cost of finance and constrained access to credit due to the risky terms of lending, lack of acceptable collateral, limited sources of long term finance, and limited information on financial products (Gielnik, 2010; Hinton et al., 2009). According to Kato (2010), mining SMEs in Uganda face problems of lack of financial empowerment like capital, investment opportunities and market trends. This becomes relevant as patterns of consumption are influenced by factors such as interest rates, inflation and exchange rates as well as credit availability, fiscal and monetary policies and disposable income (Wanger, 2007; Fleisher & Bensoussan, 2003). The rising costs of living in Uganda have affected the costs of operating mining SMEs especially the fuel fluctuation costs (Bank of Uganda, 2011; Walugembe, 2010).

- *Ecological*

The ecological component looks at both the physical and biological environments in which SMEs exist. The aspects include global climate, sustainable development, recycling, pollution as well as biotechnological advances (Wanger, 2007; Fleisher & Bensoussan, 2003). In Uganda, the mining

SMEs face environmental, health and safety problems commonly caused by poor mining methods and lack of appropriate mining equipment which result in fatal accidents (Kato, 2010; Hinton et al., 2009).

- *Political*

This is related to the government's attitude towards the SMEs which include the regulatory climate as well as legal component of the general environment which consists of the countries laws that must be followed (Wanger, 2007; Walter et al., 2004; Fleisher & Bensoussan, 2003). The mining SMEs in rural areas of Uganda are faced by challenges of lack of information on legalization procedures as evidenced by their informal status (Kato, 2010; Hinton et al., 2009).

The dynamic nature of SME start-ups in Uganda are affected by the increased demand for Start-up Decision Agility (SDA). According to GEM (2007) SDA is the ability to swiftly and appropriately adjust a set of related activities performed to achieve a given start-up goal in response to unpredictable challenges that occur beyond the normal level of flexibility. Therefore SDA is paramount for enterprises to remain competitive, and sustainable in an ever changing business environment. This has caused SME start-up government initiatives focus on ICT to enable the start-up decision process flexibly in response to the continuous changing business needs (PSFU, 2011; UMFPEd, 2010).

There is a need for relevant and quality information services for SMEs start-up in order to realize economic development in Uganda (PSFU, 2011; UIA, 2011). The mining SMEs in Uganda are characterized by fragmented and incomplete information to enable them start-up (Okello-Obura et al., 2009). Information that is necessary for decision making in the start-up activities is very crucial. According to UBOS (2007), the SMEs in Uganda make decisions based on word of mouth and from experience. They do not consult information to improve on their decision making skills which leads to enterprise collapse.

The SME start-up service providers are faced with challenges of offering innovative services to start-up entrepreneurs. Providing ICT enabled services is probably a cheaper alternative to options such as the complex interaction during the introduction of ICT in a human context. Sol (1982) suggests that methods and tools can be applied to support such complex start-up challenges by defining ways of using information technology in organizations.

In light of the challenges presented in this section, there is a need to facilitate the mining enterprise start-up process in Uganda. The development of the mining start-up services need to be enhanced and this can be done through the use of ICT enabled services that allow for complex services to be developed.

Section 1.3 introduced the start-up mining SME concerns in Uganda which explained why start-up enterprises collapse. High costs involved in investment, the need for profit and the uncertainties involved came among the concerns for SME start-ups. In addition, the major problems of lack of information services to the rural mining enterprises in Uganda given their environment, limited infrastructure, and scattered population were highlighted. Given these considerations, it is essential to facilitate and improve the mining SME start-up process in rural areas of Uganda. Such support would facilitate stakeholders' participation for decision making during the mining SME start-up process.

Research on decision enhancement services reveals that these may have profound effects on SMEs outcomes (Keen & Sol, 2008). It is necessary to enable decision makers' focus on the relevant context and specific factors that are targeted to support SME start-ups (Sol, 1988). There is a need to enhance decisions involved in mining SME start-ups in Uganda. There is a need for ICT support by providing adequate services that incorporate the essential features for mining enterprise start-ups.

1.4 Research questions and objectives

The main research question is

How can we enhance decisions for mining SME start-ups in rural areas?

This was divided into four sub-questions:

1. *What are the current key issues in SME start-ups in Uganda?*

This question is derived from a review of the challenges of SME start-ups presented in chapter one and further elaborated in chapter three with an exploratory study. It is intended to help us gain understanding on the contextual small and medium enterprise start-up challenges.

2. *What are the concepts that constitute the support for SME start-ups?*

We discussed concepts on start-up decisions and theoretical perspectives of guiding start-up decisions focusing on the decision enhancement services as the way forward for SME start-up support in chapter

two. Keen & Sol (2008) introduce the concept of a “studio” where decision enhancement is provided as a plausible solution for SME start-up support.

3. *How can the process for enhancing SME start-ups in Uganda be supported?*

This research question is designed to direct the research towards designing and developing a new approach needed to address the SME start-ups. The approach consists of services described in chapters four and five packed in a studio for enhancing mining SME start-ups.

4. *What is the added value of the studio in the process of SME start-up?*

The fourth research question dealt with the evaluation of the studio for small and medium enterprise start-ups as discussed in chapter six.

Research objectives

The main objective of this research is: *To develop decision enhancement SME start-ups services in rural areas of Uganda.*

This was achieved by splitting it into specific objectives.

- i) Understanding the start-up process for SMEs in Uganda.
- ii) Establishing concepts that constitute support for SME start-ups.
- iii) Establishing the requirements for a studio to enhance SME start-ups.
- iv) Design and develop the studio for enhancing SME start-ups.
- v) Test and validate the developed studio.

1.5 Research approach

A research approach is defined as a way of going about one’s research, which may embody a particular style and employ different methods or techniques (Galliers, 1992). The research philosophy and research strategy are presented in this section.

Research philosophy

According to Trochim, James, & Donnelly (2007), research philosophy refers to the perspectives that researchers possess in the process of knowledge development. This entails the underlying assumptions about what constitutes valid research methods. When undertaking research of any nature, it is important to consider different research paradigms and matters of ontology and epistemology. Flowers (2009), defines a research philosophy as the perceptions, beliefs, assumptions, the nature of

reality and truth (knowledge of that reality), that influences the way in which the research is undertaken, from design through to conclusions. According to Saunders, Lewis & Thornhill (2007), it is important to understand and discuss these aspects in order that approaches congruent to the nature and aims of the particular inquiry are adopted, and to ensure that researcher biases are understood, exposed, and minimized.

The philosophy guiding this study was Design Science. According to Ramesh & Rao (2005), Design Science in Information Systems (DSIS) focuses on problem solving through system development, design of human-computer interfaces and architectural designs for computing and communication. Researchers seek to understand real-life phenomena, identify practical problems, and design explicitly applicable solutions introducing appropriate artefacts that can serve human purposes (Hevner & Chatterjee; 2010; Peffers, Tuunanen, Marcus & Chatterjee, 2008; Vaishnavi & Kuechler, 2008). The output of a design is a “design artefact”. Hevner (2007) presents three important interdependent circles in design science research namely the *relevance*, *design* and *rigor cycle* as shown in Figure 1-1. The relevance cycle provides requirements from the contextual environment, and in turn introduces research artefacts to this environment. The rigor cycle provides theories, experience, expertise grounding from the existing knowledge base and accepting new insights (Winter, 2008; Carlsson, 2006; March & Smith, 1995). The design cycle presents the actual construction of the expected solution and its evaluation. It also seeks and provides feedback from and to the environment and the existing knowledge base.

Design science philosophy suits the research objectives of the study. The choice of the research perspective was based on the research field and research purpose. This was illustrated by the research objectives i.e. to understand start-up processes for SMEs in Uganda (relevance - as addressed in research question one); to establish the concepts that constitute the support for SME start-ups (rigor - as addressed in research question two) and to design and evaluate a studio “artefact” for enhancing SME start-ups (design - as addressed in research questions three and four). Conclusively, our research introduced a solution for improving mining SME start-ups in Uganda.

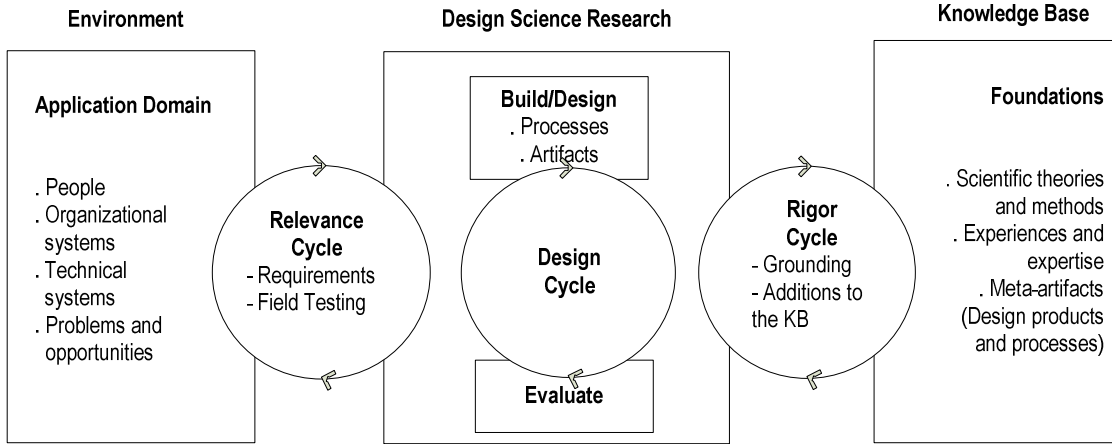


Figure 1-1: Design Science Research Circles (Source: Hevner, 2007)

Research strategy

According to Benbasat (1987), a research strategy considers the line in which a study was conducted. A research strategy is defined as an ordered set of steps followed when inquiring into the phenomenon being investigated (Yonazi, 2010; Nabukenya, 2009; Trochim et al., 2007). In choosing a research strategy, the nature of the research problem, objectives, research questions and theory development status was considered.

This research started with an exploratory study which identified mining SME start-up problems from the community, abstracted and synthesized it with an aim of understanding contextual issues that cause mining SME collapse. The inductive-hypothetical strategy is regarded as a bottom-up approach in conducting multi-disciplinary research (Sol, 1982). The inductive-hypothetical research strategy leads to four model types, which are linked by five activities, as illustrated in Figure 1-2.

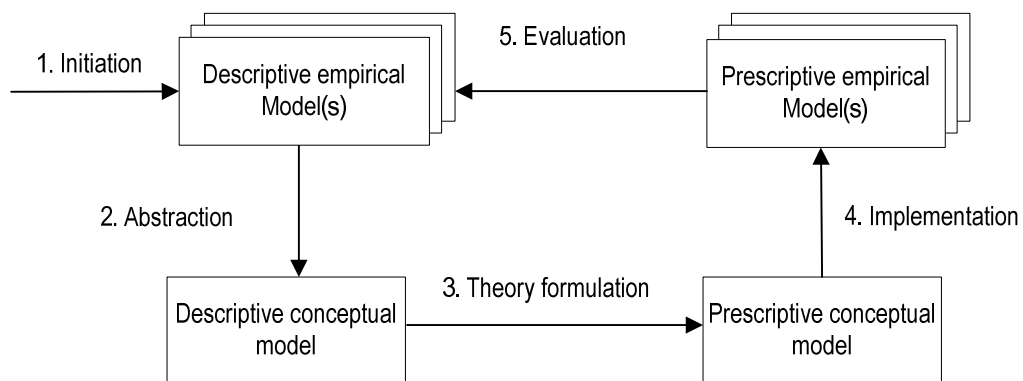


Figure 1-2: Inductive Hypothetical Research Strategy (Source: Sol, 1982)

The inductive-hypothetical research strategy consists of five steps namely initiation, abstraction, theory formulation, implementation and evaluation (Trochim et al., 2007; Sol, 1982).

Phase 1. Initiation phase

This phase is useful in gaining a clear understanding of the research problem. According to Cooper & Schindler (2008), researchers develop clearer concepts, establish priorities, develop operational definitions and improve the final research design. The aim is to enhance the understanding of enterprise start-up decisions from literature, which helped to comprehend and notice similarities and differences in the concepts. The main output of this phase was a descriptive empirical model which was important in scoping the study.

Phase 2. Abstraction phase

The abstraction phase aimed at identifying issues influencing mining SME start-ups in Uganda. The understanding derived from the initiation phase can be important in identifying SME start-up problems. The exploratory study involved inductive identification of the problems involved in starting a mining SME in Uganda. This activity could improve our understanding concerning mining SME startups in Uganda. This was expected to clarify the start-up problems and develop a suitable solution in phase 3. The main output of this phase was the descriptive conceptual model conveying the issues influencing mining SME start-up in Uganda.

Phase 3. Theory formulation phase

The theory formulation phase involved the process of the design which leads to the studio artefact. The output of this stage is a prescriptive conceptual model which is referred to as the studio artefact.

Phase 4. Implementation phase

This phase involved the implementation of a studio based on the studio artefact derived from the theory formulation phase. The output of this phase was the studio also referred to as the prescriptive empirical model.

Phase 5. Evaluation phase

The studio was evaluated and tested for its added value and relevance in facilitating the mining SME start-up process. The proposed solution was evaluated in three regions of Uganda.

1.6 Research contribution

This research noted the importance of technology to mining enterprises in developing countries. The study sought to find a way of enhancing decisions around SME start-ups in the context of a developing

country. However, the existing literature could not provide any adequate solution. From a design science perspective, the studio artefact presented in chapter four is the main contribution of this research. These suggest ways to support a mining SME start-up, which enriches the knowledge base of technology for development. This provides theoretical and practical contributions as explained below.

1. Decision Enhancement Services (DES) facilitate a starting mining SME in Uganda. The services are developed using both existing and new start-up concepts as well as perspectives from a developing country. The artefact of a studio contributes towards bridging the theoretical gap by providing a guiding framework for enhancing decisions around SME start-up initiatives especially in developing countries.
2. This research contributes towards the understanding of the current issues involved in starting mining SMEs in Uganda so as to provide a baseline for entrepreneurs to take into consideration for survival purposes.
3. The start-up studio is important in enabling miners to be aware of the opportunities and pitfalls as they start their businesses by bringing knowledge into action.
4. In practice, the artefact provides practitioners in developing countries a new toolkit for mining enterprise start-ups. If applied, the artefact will facilitate decision making during the SME start-up process in other sectors.

1.7 Thesis outline

This research involved various activities which are presented in different chapters related to the research strategy in Figure 1-3.

Chapter 1: This chapter explains SME start-ups, the roles of ICT in SME start-ups, the challenges faced by SME start-ups, research questions and objectives, and the research approach. Chapter one aims at explaining the research area, problem and the significance of conducting this research.

Chapter 2: Chapter two looks at the start-up process and decision enhancement aimed at addressing the research question two by reviewing the necessary concepts that constitutes support for the enterprise start-ups.

Chapter 3: This chapter presents and describes the exploratory study, the data collection approach, the results and the challenges derived from the case study.

Chapter 4: This chapter identifies requirements based on the exploratory study and literature. The studio design is explained in chapter four.

Chapter 5 looks at the implementation of the studio. This chapter addresses the implementation considerations and studio description.

Chapter 6 presents the evaluation of the mining enterprise start-up studio in Uganda. Here, testing will be carried out with an aim of addressing the usefulness, usability and usage of the studio.

Chapter 7: Lastly, chapter seven concludes by reflecting on the whole research process in terms of the research questions, approach, and recommends aspects that need to be addressed for future research.

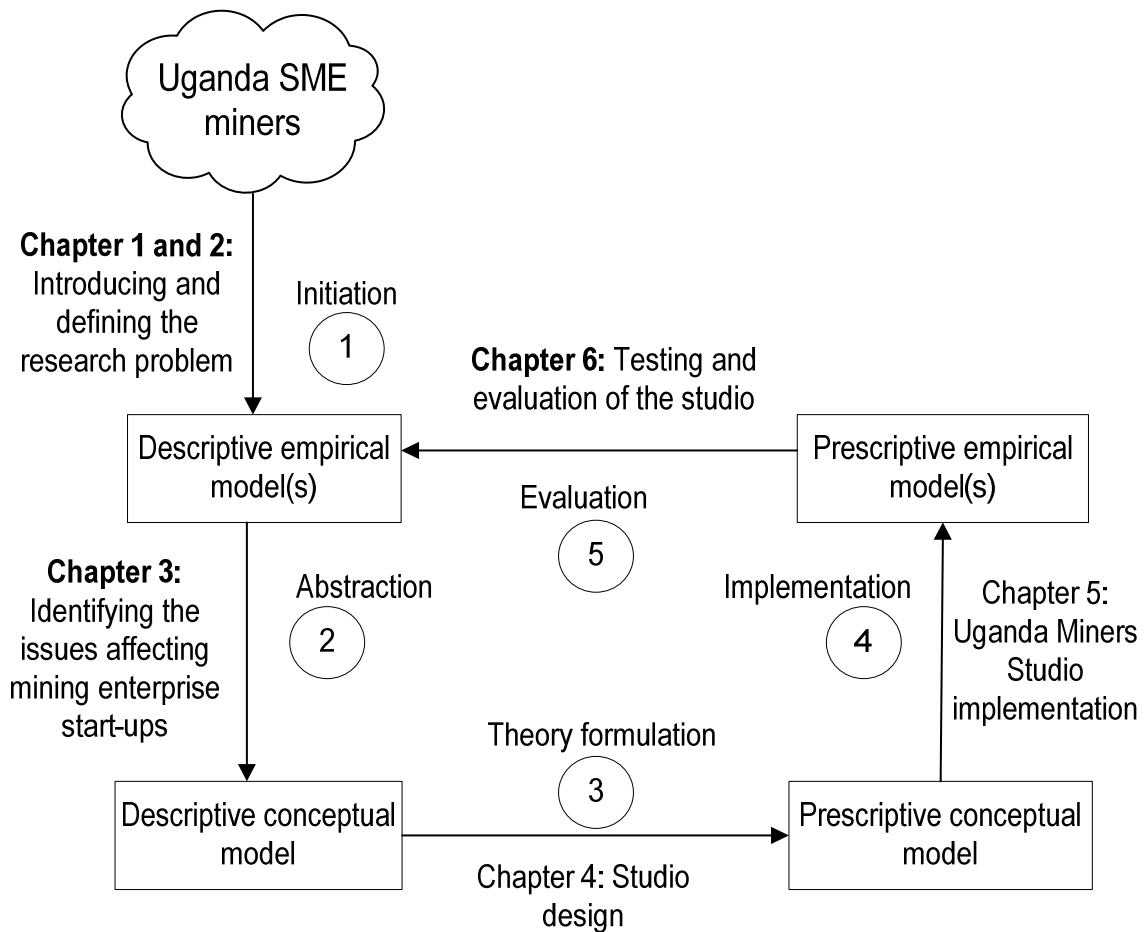


Figure 1-3: Chapter Flow Based on the Research Strategy

CHAPTER 2. SME START-UP AND DECISION ENHANCEMENT

In chapter 2, relevant concepts on SME start-ups and decision enhancement services drawn from literature are discussed in relation to the start-up support services. This understanding is vital for informing us about the theories and practical limitations in SME start-ups. In the first section we provide a brief background on enterprise start-ups, SME start-up theories and the start-up decisions. The start-up theories help us understand the start-up process from a complexity and life cycle perspective. The SME start-up decisions provide us with the start-up steps which help us identify the start-up decision issues from literature. We then discuss the theoretical perspectives guiding start-up decisions with an aim of identifying the main themes that help us understand what could be considered when developing the start-up services. We then look at decision enhancement services (DES) as the approach to enhance SME start-ups by looking at the start-up service and the current practice of DES in developing countries. We conclude this chapter with a reflection on literature and the need for decision enhancement services.

2.1 Enterprise start-up

The enterprise start-up process “is a course of action that involves activities, technology and stakeholders associated with identifying and evaluating perceived opportunities and bringing together of resources to enhance formation of an enterprise” (Kunene, 2008; Cornwall & Naughton, 2003; Bygrave, 1997, 1993, 1989).

SME start-up theories

Two main theories describe the SME development process namely the life cycle and complexity start-up theories. In the former, the organizational life cycle theory investigates the issue of start-up development (Timmons, 1999). The assumption is that the start-up process follows predictable patterns that can be developed into several sequential stages (Kunene, 2008; Smith, Mitchell, & Summer, 1985). The life cycle theory suggests that start-up development is a progressive and linear process and all enterprises must face certain key problems during each of these stages (Tsai & Lan, 2006; Kaulio, 2003). The start-up development is predictable and entrepreneurs can plan management activities and adjust organizational structures a head of time (Kunene, 2008; Stoke & Wilson, 2006; Pretorius, Van Vuuren, & Nieman, 2005; Block & MacMillan, 1985).

The complexity theory looks at the start-up development process as dynamic, non-linear, and unpredictable (Tsai & Lan, 2006). Complexity theory is characterized by dynamic states of co-evolution with management and the creation of order (Mckelvey, 2004, 2002). A complex system is defined as a type of “dissipative structure” where the “self generating” and “self renewing” processes produced by the rapid and consumption of the large amounts of resources cause the system’s structure to be maintained (Tsai & Lan, 2006; Prigogine, 1955). Due to the influx of resources, a complex system stays in a state of continuous change that creates new patterns in response to the dynamic environment. The major component of the complexity theory is the chaos theory (Bygrave, 1989).

Unlike the life cycle theory that views the start-up process as being predictable, complexity theory looks at the start-up process as being chaotic, unpredictable and dynamic (Tsai & Lan, 2006; McKelvey, 2004, 2002; Chiles, Meyer, & Hench, 2004; Lichtenstein, 2000, 1997; Slevin & Covin, 1998; Eggers, Lehey, & Churchill, 1994; Gersick, 1988; Bygrave, 1989).

Table 2-1 presents a comparison of the life cycle and complexity theories.

Table 2-1: Comparison of two enterprise start-up development views

Theoretical perspective	Life cycle theory	Complexity theory
Basic assumptions	<ol style="list-style-type: none"> Holistic view point of the start up process. Organizations are stable systems, and can therefore achieve a state of balance, The environment is predictable and change is an exception 	<ol style="list-style-type: none"> Start up process is an individual's viewpoint Organizations are dissipative structures, and are therefore always in a state of imbalance The environment is unpredictable and change is the rule
Main arguments concerning enterprise start-up development	<ol style="list-style-type: none"> The development of a start up is a progressive and predictable process This process is constructed from different stages because an organization faces different problems during each stage, it should possess different management skills, make different decisions, and assume a different form during the stages. Start-ups will encounter a crisis during each stage and the ability for an enterprise to survive and continue to grow hinges upon whether it can manage these crises Entrepreneurs can predict what problems the organization will encounter in the future and map out response strategies and plan ahead of time, which eliminates all uncertainty and change 	<ol style="list-style-type: none"> The development of a start up is a chaotic process This process consists of a series of new emergent orders, and an organization therefore exhibits discontinuous growth Start ups may encounter “thresholds” or “transitions”, a start-up can exhibit a new order only after it surmounts such a threshold It is difficult for entrepreneurs to make advance plans because they cannot predict what new order emerge. Entrepreneurs can rely on their vision, however, to guide the actions of other members of the organization and maintain flexibility with regard to future development

Source: (Tsai & Lan, 2006)

The insights derived from the comparison presented in Table 2-1 shows that the enterprise start-up process is assumed to either be holistic or individual with a stable or a dissipative structure in either a predictable or dynamic environment. Both the life cycle and complexity theories are relevant to the understanding of SME start-up concepts in this study. An entrepreneur faces multifaceted composite enterprise start-up problems created by the dynamic environment (Tsai & Lan, 2006).

The enterprise start-up process is classified by authors in several distinct stages (Kunene, 2008; Pretorius et al., 2005; Stoke & Wilson, 2006; Scott & Bruce, 1987; Block & MacMillan, 1985). Although many steps are valuable, not all of them convey the actual meaning of enterprise start-up process. Walter et al., (2005), observes that it is important to use definitions that provide a meaningful understanding of enterprise start-up process. Inadequate definitions may lead to a poor comprehension of enterprise start-up. This section discusses enterprise start-up process definitions and presents the one adopted by this research.

Pretorius et al. (2005) narrowly defined the enterprise start-up process with 2 stages i.e. (a) opportunity recognition and (b) resource acquisition. Other authors consider three stages for this process. Grubber (2002) suggests that the enterprise start-up process has three distinct stages on one hand including (a) the pre-founding stage i.e. opportunity identification and evaluation; (b) a founding stage i.e. business plan, resource gathering, incorporation and market entry; and (c) an early development stage i.e. building the company and market penetration. On the other hand, Baron (2004) considers the 3 stages to be (a) screening ideas for feasibility; (b) assembling needed resources and (c) actual development of a new business.

Bhave (1994) is a pioneer in including the technology set-up aspect and expands the start-up stages from 3 to 4 stages i.e. (a) opportunity identification (b) organization creation (c) exchange and (d) technology set-up. Other attempts to provide broader descriptions include Greiner (1972) who categorizes the enterprise start-up process into 4 distinct stages of (a) growth through creativity, (b) growth through direction, (c) growth through delegation, and (d) growth through collaboration. Later on Rwigema & Venter (2004) redefined the 5 stages as (a) identifying, measuring and refining an opportunity from multiple ideas; (b) formulating a business plan; (c) marshalling the resources; (d)

organizing and mobilizing a team; and (e) overseeing the new venture creation growth. Regardless of the stages in which the start-up process is explained the main issues found in literature include:

- Identifying, evaluating and refining an opportunity
- Resource gathering, business plan creation i.e. direction adjustment, and team mobilization i.e. organization formation
- Development, growth, maturity and pricing adjustment decisions.

Although the description of the enterprise start-up process stages is linear and discontinuous in practice these stages overlap, interact and depend on each other (Kunene, 2008; Tsai & Lan, 2006). Enterprise start-up is a dynamic process changing the way entrepreneurs traditionally start-up a business. A wide range of ICT facilitates the enhancement of the enterprise start-up process. It ensures that the entrepreneur and stakeholders are satisfied with the services needed in the start-up process. This can be achieved by enhancing the enterprise start-up process issues.

This research adopts the enterprise start-up process stages described by Kunene (2008). The four stages used in our analysis are:

- *Stage 1:* This includes generating the idea, creativity/innovation, identifying market opportunities, information search, conception, screening ideas for feasibility, identifying where to extract value and the development of a product.
- *Stage 2* involves triggering events such as gestation, motivation to start a business, the decision to proceed, business planning, identifying the different resources required, risk assessment, resource acquisition and assembling.
- *Stage 3* entails implementation which includes setting up and launching the new venture, business strategy, implementing the business plan, running the business, deploying of resources, building success and managing the enterprise.
- *Stage 4* comprises of the growth phase which involves maximizing profits, harvesting the rewards and continually growing the enterprise to include other opportunities.

Different decisions are made in the enterprise start-up process stages. Studying the decision processes in enterprise start-ups will highlight the problems involved.

2.2 SME start-up decisions

This section examines the four stages of the enterprise start-up process which subsequently identifying 14 decision issues.

Stage 1: Initiation

This initial stage in the enterprise start-up process is the identification and refining of viable opportunities that exist in the market (Kunene, 2008; Baron, 2004, 2000; Timmons, 1999). The opportunity identification stage can be divided into five steps i.e. getting the idea or scanning the environment, identifying the opportunity, developing the opportunity, evaluating the opportunity and evaluating the team (Kunene, 2008; Ardichvili, Cardozo, & Ray, 2003).

- **Getting the idea**

Rwigema & Venter (2004) define an idea as the conception of a possibility and a reflective method of evading, circumventing obstacles and challenges. Robertson, Collins, Medeira, & Slater (2003) argue that there is a link between getting the initial idea and starting an enterprise. Wickham (2001) defines a market opportunity as a gap left in the market by those who currently serve it, giving a chance to others to add unrealized value by performing differently from and better than competitors in order to create new possibilities. An opportunity is the possibility of occupying the market with a specific innovative product that satisfies a real need for which customers are willing to pay (Kunene, 2008; GEM, 2007; Timmons, 1999). A successful enterprise start-up rests on the ability to recognize an opportunity from an idea (McCline, Bhat, & Baj, 2000). The entrepreneur is faced with challenges of generating ideas when scanning the environment (market) to identify an opportunity.

- **Identifying the opportunity**

Man, Lau, & Chan (2002) state that opportunity identification is basically seeking better ways of competing. Kirzner (1973) supported a theory of enterprise alertness to market opportunities, thereby describing it as the entrepreneurs' ability to see, discover and exploit opportunities that are needed. Markman & Baron (2003) identified steps involved in opportunity identification, namely scanning the informational environment, being able to capture, recognize and make effective use of abstract, implicit and changing information from the dynamic external environment. The entrepreneur faces challenges of scanning the informational environment when identifying an opportunity.

- **Developing the opportunity**

The opportunity development challenge faced by the entrepreneur includes deciding on the idea to match the market opportunity. Having recognized the opportunity, timely adaptation of the opportunity to suit the actual market need is key to enterprise start-up success (Kunene, 2008; Morris & Zahra, 2000). Opportunity development is defined as the process of combining resources to pursue a market opportunity identified (Kodithuwakhu & Rosa, 2002). Markman & Baron (2003) suggests that opportunity development involves systematic research to refine the idea to the most promising high potential opportunity that can be transformed into marketable items.

- **Evaluating the opportunity**

A critical element of the enterprise start-up process is evaluating the opportunity (Kunene, 2008; Ucbasaran, Westhead, & Wright, 2004). According to Hisrich, Peters, & Sherpherd (2005) professionally executed evaluation tells whether the specific product has the returns needed to justify the investment and the risk to be taken. Evaluating the opportunity involves various items namely the product description, market opportunity, costing and pricing, profitability, capital requirements, risks and forecasts (Kunene, 2008; Rwigema & Venter, 2004; Gartner, Starr, & Bhat, 1999; Timmons, 1999). The decision of evaluating the returns from a given idea is vital to the entrepreneur.

- **Evaluating the team**

The challenge of group dynamics with different interests and sourcing for the skilled manpower are important to the entrepreneur. Despite the right opportunity, it may not make a successful enterprise unless it is developed by a team with strong skills (Kunene, 2008; Bygrave, 1997). Gartner et al. (1999) advises that once the opportunity has been evaluated, the next step is to ask questions about the people who would run the enterprise. Such questions may include the entrepreneurs focus, management and ownership issues (Kunene, 2008; Gartner et al., 1999).

Stage 2: Triggering

Kunene (2008) states that the triggering stage can be divided into four steps i.e. the decision to become an entrepreneur, business plan development, the assembling of resources to create the enterprise, developing the enterprise boundary and exchange of resources across that boundary.

- **Inspiration to become an entrepreneur**

Baron (2004) says that the crucial step in enterprise start-up is the decision to become an entrepreneur. According to Wickham (2001), the necessity or opportunity factors motivate the actual decision to become an entrepreneur.

- **Gathering resources**

Having evaluated the required resources and strategies into a business plan, the next thing is gathering the resources needed to achieve the plan. Gartner et al. (1999) consider resource acquisition as important as opportunity discovery, since absence of resources in the enterprise start-up process results into failure. Kunene (2008) states that there are six key resources needed for enterprise start-up, namely technical know how (Rwigema & Venter, 2004), finance (Erikson, 2002), physical assets (McMahon, 2001), human resource (Kodithuwakhu & Rosa, 2002) and intangible resources including information, networks, patents, technology and brand reputation (Morris & Zahra, 2000). The entrepreneur faces challenges of identifying and acquiring resources; hence the need for technical and financial support.

- **Business plan creation**

Wickham (2001) states that once the entrepreneur has formulated a strategy, it is necessary to formalize a business plan which is vital in opportunity exploitation and determining the resources required. The business plan is important in the planning process as suggested by Kunene (2008) and Baard & Van den Berg (2004). The entrepreneur is faced with challenges of formulating a business plan.

Figure 2-1 shows the process of planning as illustrated by Kunene, (2008) and Baard & Van den Berg (2004).

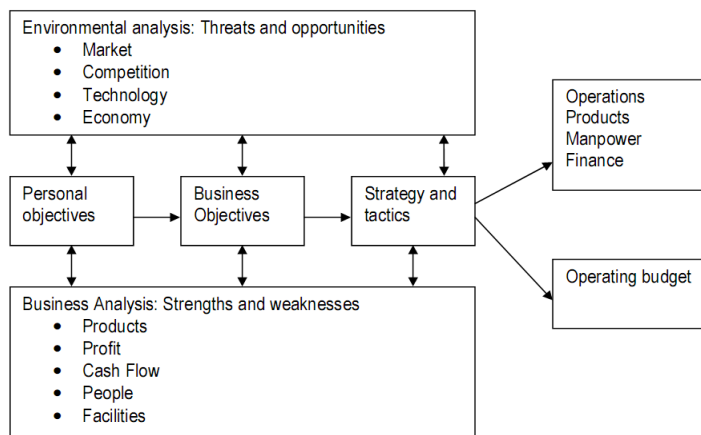


Figure 2-1: The Planning Process for an Enterprise (Source: Adopted from Kunene, 2008)

Stage 3: Implementation

After the resources have been acquired in the previous stage, it is necessary to implement the business plan into action. According to Rauch & Frese (2000), action consists of goal development, redefinition, detailed planning, execution, monitoring the plan, feedback and developing future visions. The entrepreneur faces the following challenges in this stage: growing managerial competencies, setting up production processes, structures and systems, quality control, waste elimination, cost effectiveness, dealing with distributors and suppliers, selling to customers, collecting finances, resolving operational problems, fending of competitors, moving towards the goal and determining the key variable for enterprise success (Kunene, 2008; Hisrich et al., 2005; Rwigema & Venter, 2004; Man et al., 2002; Gartner et al., 1999). Kunene (2008) and Nieman (2006) consider planning, organizing, leading and controlling as the four management principles essential in this stage.

Stage 4: Growth

The fourth stage is the growth stage that consists of the following challenges market expansion, technology change, harvest resources, operations and organizational development (Kunene, 2008; Rwigema & Venter, 2004; Man et al., 2002).

From the above presented four stages, Kunene (2008) identifies 14 enterprise start-up issues vital to the decision process. These are core to this research.

- *Opportunity identification*: this is the ability to see, discover and exploit opportunities by scanning the information environment, then deciding on the idea that matches the market opportunity (Pretorius et al., 2005; Baron, 2004; Kirzner, 1973). This can be achieved by evaluating the returns from a given idea and adaptability to change (GEM, 2007).
- *Formulating a business plan*: it entails rules in developing the business plan strategies which may include market strategies, forecasts, developing and re-defining goals (Man et al., 2002).
- *Identifying and acquiring resources*: It involving exploring various ways of identifying financial resources. This also includes the ability to gather and control resources (Bradley, 2002).
- *Communication*: the ability to identify and interact with individuals from different cultural backgrounds, expertise with varying interests (Guzman & Santos, 2001).
- *Financial management*: the ability to express opportunity identification in forecasting financial estimates (Kazooba, 2006; Erikson, 2002).

- *Human resource*: the ability to evaluate the opportunity and how it fits within the technical skills of the team (Perks & Struwig, 2005; Davila, Foster, & Gupta, 2003; Robertson et al., 2003).
- *Learning abilities*: the ability to adapt to changes and adjustments (Man et al., 2002; Ardichvili et al., 2003).
- *Legal support*: the ability to seek advice on rules and procedures for authorized enterprise start-up (Gartner et al., 1999).
- *Marketing*: the ability to identify and analyze the niche markets, customers and competitors. (Gartner et al., 1999).
- *Motivation*: the ability to systematically scan and spot market opportunities (Rwigema & Venter, 2004).
- *Networking*: this is a way of identifying opportunities (Drakopoulous & Patra, 2002).
- *Problem solving*: the ability to identify a business opportunity and the capacity to solve day-to-day challenges (Baron, 2004).
- *Research and Development (R&D)*: the adaptability to opportunity identification through intelligence gathering efforts i.e. gathering, disseminating, sharing and acting on intelligence (Hill & Stewart, 2000).
- *Calculated risk taking*: is important in opportunity identification, analysis and development (Baron, 2004).
- *Time management* in identifying market opportunities in improving business performance for the SME (Rwigema & Venter, 2004).

The above mentioned items are vital to the decision process in starting SMEs. A decision process involves choosing among alternative courses of action for the purpose of attaining a goal (Power, 2004; Turban, Aronson, & Bolloju, 2004; Mintzberg, 1983; Mintzberg, Raisinghani, & Theoret, 1976). It involves interplay of participants faced with problems and searching for solutions by making choices. According to Ackoff (1981), a decision problem exists where an individual or group perceives a difference between a present state and a desired state involving alternative courses of action. Although perceptions change with variations in the environment, the managers' opinion is influenced by the entrepreneur's character, organizational structures, and the choices (Nabuuma, 2010; Yasai-Ardekani, 1997). This makes the stakeholders involvement critical for the effectiveness of enterprise start-up decisions.

Start-up decision agility

The dynamic nature of SME start-ups and the increasing competition in terms of costs, quality, stakeholders and the environment has increased the demand for Start-up Decision Agility in enterprises. SDA is therefore paramount for enterprises to remain competitive, and sustainable in an ever changing business environment. The general argument put forward is that entrepreneurs need feedback about the start-up process issues. The feedback process is concerned with assessing whether the start-up issues were successful and determining whether the activities need to be adjusted, or terminated (Marshall, Mclvor, & Lamming, 2007). It also involves establishing whether each start-up goal has met the criterion that was initially established as well as the nature of the relationship with the stakeholders. It is clear that SDA enables entrepreneurs to flexibly and easily make and adapt to adjustments within the enterprise start-up process. Therefore, this points at various approaches that have been used to improve the enterprise start-up process as a result of the dynamic environment as explained in the next section.

2.3 Theoretical perspectives guiding start-up decisions

While the lifecycle and complexity theories have been prominent in explaining the start-up decision process (Tsai & Lan, 2006), there has been increasing concern over the ability to support the enterprise start-up decision process. Although the lifecycle and complexity theories provide support in understanding the start-up decisions, the existence of an inter-organizational relationship and stakeholder involvement in the start-up stages implies additional challenges that make the mentioned theories (lifecycle and complexity) incapable of providing adequate support for SDA.

A number of theoretical lenses have been used to provide more insight about supporting start-up decisions. Among these are the transaction cost economics (TCE) theory (Williamson, 1985), inter-organizational theories (Thompson, 1967; Nooteboom & Gilsing, 2004), social exchange theory (SET) (Kern & Willcocks, 2000), process management approaches (De Bruijn, 2002), systems development approaches i.e. systems engineering approaches, component based development, collaborative business engineering (Hengst & De Vreede, 2004; Sage & Armstrong, 2000; Brown, 2000; Den); information systems design theories (Boehm et al., 2001), service system approach (Van de Kar, 2004) and decision enhancement services (DES) (Keen & Sol, 2008). Studying these theories is relevant to

start-up decision approaches aimed at deriving potential starting points for enterprise start-up decision processes.

- **Transaction Cost Economics (TCE)**

In TCE transaction costs serve as a measure of efficiency for the evaluation and selection of various institutional arrangements. TCE is an interdisciplinary approach to the study of economic organization in which the transaction is the unit of analysis (Williamson, 1985). TCE is based on two behaviour assumptions (a) bounded rationality and (b) opportunism (Williamson, 1985). Williamson (1999) suggests that start-ups entail transaction costs which include; searching, information gathering, monitoring and controlling, and safeguarding interests of transacting parties. In addition, the supplier markets entail risks of buyers with respect to price, quality and time (Nabuuma, 2010). These costs differ from others based on two dimensions: degree to which transactions occur and the complexity of start-up decisions (Nabuuma, 2010). Williamson (1985) identified three types of specificity: environmental, physical and human asset. The human aspect refers to the transaction know-how accumulated by transaction through stakeholder involvement. Argyris (1999) points out that focusing on the characteristics of isolated transactions could be insufficient to explain the scope of the firm especially when transactions within the firm are interrelated. Argyris (1999) argues that what TCE might predict as an appropriate governance mode for a single transaction might be costly when analysed in light of other transactions due to existing interdependencies among them. TCE advocates for internalization of activities involving high asset specificity for the fear that these trigger opportunistic behaviour amongst stakeholders thus leading to an escalation of start-up transaction costs.

TCE fails to recognize that enterprises are involved in complex and collaborative relationships that entail high levels of asset specificity as well as uncertainty and opportunism. The criticism regarding the TCE approach is related to the use of the transaction as the unit of analysis.

- **Inter-organizational theory**

Powell (1990) and Van de Kar (2004) argue that to support inter-organizational enterprise start-up networks, it is necessary to take into account the market, hierarchy and network forms besides economic exchange.

- i) In market transactions the benefits to be exchanged are clearly specified, no trust and agreements are required. The means of communication are prices. The degree of flexibility is high with the amount of commitment low, and the climate is precision and / or suspicion and the actors are independent.
- ii) In hierarchies, communication occurs within bureaucratic ways, relationships matter and the context of stakeholders exchange depend on formal authority structures. The means of communication are routines. The degree of flexibility is low, the amount of commitment is medium to high, the climate is formal, bureaucratic, and the actors are dependent.
- iii) The network forms of exchange entail indefinite and sequential transactions within the context of a general pattern of interaction. Here, the endorsement is normative rather than legal. The means of communication are relational. The degree of flexibility is medium, the amount of commitment is medium to high, the climate is open-ended, mutual benefits and the actors are interdependent.

Enterprise networks have emerged as an organizational form to overcome the problems with hierarchies and to create greater structural effectiveness and responsiveness with stakeholders (Powell 1990). Networks have no high or low coordination and production costs and are in the middle of hierarchies and markets. Coordination in a situation of interdependence can be achieved by standardization, by plan and by mutual adjustment (Thompson, 1967). Networks can be described by the characteristics of members (stakeholders). If a network is limited to the core business of its members, then the scope is narrow. A network must also have clearly defined membership limits such as the goal of the network (Jones & Hesterly, 1998). With network membership being established, the stakeholders contribute to the attainment of the goal (Mulira, 2007; Van de Kar, 2004; Jones & Hesterly, 1998).

Nooteboom & Gilsing (2004) distinguish between two networks relevant to this research; exploration and exploitation networks. The former entails the development of new practices while the latter involves improvements with respect to established practices. Powell (1990) identifies the following factors about networks, which are useful for the formulation of enterprise start-up dynamic contexts. Non-commercial context (Van de Kar, 2004), embedded relational ties (Uzzi, 1996), and network interdependencies (Maitland, Van de Kar, & Wehn de Montalvo, 2003), specific roles and stakeholders (Maitland et al., 2003), flexibility of interaction (Mulira, 2007), membership limitation related to goals, exploration and exploitation (Nooteboom & Gilsing, 2004), competitive advantage (Porter, 1985). Enterprise start-up

decision services are developed in a network where enterprises and stakeholders cooperate and collaborate.

- **Social Exchange Theory**

The Social Exchange Theory (SET) is used in explaining the creation of cooperative relationships in enterprise start-up decision arrangements (Nabuuma, 2010). It focuses directly on the social process of give and take between parties and aims to promote an understanding of the behaviour of each stakeholder contributing to the relationship (Kern & Willcocks, 2000). Under SET, exchange interactions involve economic and social outcomes (Lambe, Wittmann, & Spekman, 2001). Each party in an exchange relationship compares the social and economic outcomes from their interactions to those that are available from exchange alternatives (Kern & Willcocks, 2000).

The initial transactions are crucial in determining whether the start-up relationship will expand, diminish, remain the same or dissolve (Lambe et al., 2001). SET has the potential to dissect the transaction process and to explain the interdependent contingencies in which each response is dependent on the other's prior action and simultaneously the stimulus evoking the other's further reaction (Kern & Willcocks, 2000). Enterprise stakeholders evaluate outcomes from each transaction and compare them to the level felt deserved as well as to the level of benefits provided by other exchange partners. If the exchange is considered acceptable, future interactions may occur. Lambe et al. (2001) argue that the key activity that drives all the relationship development stages and allows enterprises to make outcome comparisons to desired comparisons and alternative offerings are exchange episodes or interactions that occur during various stages of relationship development (Lambe et al., 2001).

Mulira (2007) and Warren (1967) characterize inter-organizational networks as a form of inclusive decision making structure with four types of contexts:

- *The unitary context*: Member organizations are deliberately organized for the achievement of inclusive goals. Decision making takes place at the top of the integrated structure.
- *Federative context*: Organizations have their individual goals, but there is a formal organization for the accomplishment of inclusive goals. Decision making is by a specific part of the inclusive structure but subject to ratification by the units.

- *Coalition context*: Organizations cooperate more or less closely to attain desired objectives. Each organization has its own goals but collaborates informally. There is no formal organization for inclusive decision making. The coalition has no authority.
- *Social-choice context*: Organizations retain an autonomous behaviour, but they relate and come together on particular issues that concern all of them. They do not necessarily share inclusive goals.

These four types of context, present the research with different types of decision structures and strategies which can be considered for suitability to accomplish particular enterprise start-up goals. Network organizations need to adopt a formal coordination and collaboration structure for effective enterprise start-up decision making. Therefore, requirements formulation for network creation and sustainability in a dynamic environment should reinforce positive qualities and cater for critical elements. These include the distinction between the exploration and exploitation network phases, formalization of roles, appropriate governance mode and structure as well as flexibility that balances parallel and distributed goals and values (Van de Kar, 2004). Although SET provides a useful lens through which to understand and evaluate start-up decisions, it is limited to interactions solely between individuals and groups (Kern & Willcocks, 2000).

- **Process and project management approaches**

Process management techniques are relevant to the understanding of enterprise start-up network coordination and stakeholder involvement in the start-up design process. De Bruijn, ten Heuvelhof, & Veld, (2002) argue that stakeholder values, arguments and language are important in a process management approach with a focus on identification and implementation of changes. The design requirements are more than involving parties (stakeholders): a sense of urgency, openness and integrity, protection of core interest and core values of the stakeholders, incentives for continuation, and process type arrangements to facilitate sufficient content (De Bruijn et al., 2002). The stakeholders focus on the following; agreements, meetings and negotiations. The process architect has to design the process that results from negotiations with the involved stakeholders. The core elements of process design are: openness, protection of core values, speed and substance (De Bruijn et al., 2002). All these factors contribute to the network of stakeholders using the relevant theory to be able to specify the requirements.

Process management can be positioned alongside project management techniques (Van de Kar, 2004). Project management is one of the basic forms of management used to control projects (De Bruijn et al., 2002). In project management it is assumed that problems and solutions are reasonably stable within certain limits and the management techniques like clear goals and targets, time schedules, a clear framework and prefixed end product can be used (De Bruijn et al., 2002). De Bruijn et al. (2002) argue that this only works in a static world and that this approach is impossible for dynamic activities. Additionally, De Bruijn et al. (2002) state that “enterprise start-up processes are dynamic particularly when decisions have to be made in a network of stakeholders. The various parties hold different views about how a problem and a solution should be defined. As a result, the decision making will always be capricious and unstructured”.

- **Systems development approaches**

The discussion of systems development approaches is critical to the abstraction of comparisons of approaches. The systems thinking approach is used to define the perspective of various system design approaches. This section addresses concepts of systems engineering, component based development, and collaborative business engineering.

- i) **Systems engineering approaches**

A system can be defined as *a whole of objects one would like to recognize in a certain problem area under study, during a certain period of time* (Sol, 1982). A system is also defined as a group of components that work together for a specific purpose (Sage & Armstrong, 2000). This research is intended to develop guidelines for organizations with varied resource deficiencies, technology infrastructure and system components to effectively deliver services to users for enterprise start-ups. Engineering can be defined as *designing solutions for actual and practical problems* (Van Meel, 1994). Systems engineering can be defined in different ways, but all definitions consist of formulation, analysis and interpretation effort (Van Meel, 1994). Therefore systems engineering can be seen as a management technology that includes knowledge perspectives, knowledge principles and knowledge practices (Sage & Armstrong, 2000; Checkland, 1999). Knowledge perspectives represent the present reality and future; knowledge principals represent the problem solving approach; and knowledge practices represent the standard operating policies based on accumulated wisdom and experiences (Sage & Armstrong, 2000; Checkland, 1999).

Sage & Armstrong (2000) present ten issues that must be dealt with to manage large systems. (1) many considerations and interrelations (2) many different and perhaps controversial value judgments (3) knowledge from several disciplines (4) knowledge at the levels of principles, practices and perspectives (5) considerations involving product definition, development and deployment (6) considerations that cut across the three life cycles associated with systems planning and marketing and system acquisition or production (7) risks and uncertainties involving future events that are difficult to predict (8) fragmented decision-making structures (9) human and organizational needs perspectives and value perspectives as well as technology perspectives and (10) resolution of issues at the level of institutions and values as well as the level of symptoms.

From the ten issues presented, the following items relate to this research in designing enterprise start-up challenges. In line with item 3, the enterprise start-up study is multi-disciplinary involving knowledge from different disciplines e.g. entrepreneurship or new venture expertise (Kato, 2010; Hinton et al., 2009; Kunene, 2008). Additionally knowledge is drawn from design of systems (Van de Kar, 2004; Sage & Armstrong, 2000; Checkland, 1999), software engineering (Brown, 2000; Boehm, 1988), service delivery (Van de Kar, 2004), and decision enhancement services (Keen & Sol, 2008). A start-up enterprise can take decisions in line with their organization strategy (Tsai & Lan, 2006; Porter, 1985). In order for the organizations to interact there is need to consider the inter-organizational theories (Powell, 1990). The process management and project management knowledge is important for enterprise start-up decision processes (De Bruijn et al., 2002). According to Tsai & Lan (2006) the enterprise start-up process is complex and chaotic due to the unpredictable and dynamic environment (Item 7). This shows that enterprise start-up services have to embrace the perspective of the stakeholders in handling the dynamic enterprise start-up field (Item 9). Therefore in the enterprise start-up decision process, it is necessary to have guidelines, information searching coupled with stakeholder involvement in making a decision.

According to Checkland (1999) hard thinking is appropriate in well-structured technical problems and soft thinking is more appropriate in fuzzy ill-structured situations involving human beings and cultural considerations. Additionally the observer in the hard world perceives the real world as a system and the observer in the soft world as complexity and confusion in which the observer can see a learning system (Checkland, 1999). In this description, the soft world description fits with the uncertainties in enterprise

start-up as described in chapter 1. Hard and soft thinking are combined in Business Engineering (BE) which is placed between information systems design and organization design (Van Meel, 1994).

ii) Collaborative Business Engineering (CBE)

CBE is derived from Business Engineering (BE). Van Meel (1994) states that the design perspective on the role of ICT in organizations is labeled as BE. The BE approach is based on the Dynamic Modelling (DM) approach that has proven evidence of its suitability for dealing with design of complex human activity systems in different types of problem situations (Wang, 2007; Van de Kar, 2004; Bockstael-Blok, 2001; Sol & Crosslin 1992). This approach has also been applied and developed in numerous studies in several types of problem situations. Some include design of organizational coordination (Gonzalez, 2010; Laere, 2003; De Vreede, 1995; Van Meel, 1994), inter-organizational systems (Okoronkwo, 2010; Mulira, 2007; Bockstael-Blok, 2001) and mobile information system design (Wang, 2007; Van de Kar, 2004). These scholars describe case experiences and lessons learned using Collaborative Business Engineering (CBE). The “collaborative” component is important for this research since mining enterprise start-up services have to be designed in a network of stakeholders or actors. One organization cannot design services on its own since services are the result of coordinated design activities by different actors. A Group Support System (GSS) session is recommended as a suitable support environment to get feedback from the different actors (De Vreede, 1995).

The CBE approach is aimed at dealing with solving ill-structured problems (Den Hengst & De Vreede, 2004). The design approach should not focus on finding the single optimal new organizational design, but on facilitating a diagnosis and design process that will yield a satisfying and acceptable solution (Den Hengst & De Vreede, 2004). The CBE approach is usually based on problem solving (Den Hengst & De Vreede, 2004). The design activities for solving CBE problems are problem formulation, problem conceptualization, model specification, model checking, solution finding and implementation (Mulira, 2007; Den Hengst & De Vreede, 2004; Van de Kar, 2004). The relevant elements in CBE are based on the following items:

- Incremental improvements are defined as enhancement implemented on a continual basis as opposed to radical thinking (Den Hengst & De Vreede, 2004; Van de Kar, 2004). When designing mining enterprise start-up services it is important to combine incremental improvement with radical thinking because if not combined the organization gets locked in their processes and may miss

opportunities. Radical thinking is also impossible since organizations and the markets have their history and institutional norms (Van de Kar, 2004). The CBE approach allows for both incremental improvement and radical change (Mulira, 2007; Den Hengst & De Vreede, 2004; Van de Kar, 2004).

- The CBE approach combines the hard and soft system thinking from systems engineering. The hard and soft thinking are relevant when designing mining enterprise start-up services. Hard system thinking is useful to deal with the engineering aspects: designing the network infrastructure, middleware and applications, and soft thinking goes through the learning, dealing with actors and reaching consensus among the actors within the value network (Checkland, 1999).
- Modelling is a prominent feature in the CBE design. Modelling facilitates accurate SME start-up process from visual aids. Instant feedback is critical in managing SME start-ups. Visualization is useful in the design process of mining enterprise start-up services. Modelling visual interactive features graphically may be time consuming but it has a high added value in terms of a vehicle for communication and gaining insight (Van de Kar, 2004).
- Negotiation techniques such as win-win approach: A win-win approach is defined as a set of principles, practices and tools, which enable a set of interdependent stakeholders to work out a mutually satisfactory (win-win) set of shared commitments (Mulira, 2007; Boehm et al., 2001). In the EasyWinWin approach the win-win spiral model is combined with collaborative knowledge techniques and automation of Group Support System (GSS) (Briggs & Gruenbacher, 2002). This approach has been applied in more than 50 projects (Briggs & Gruenbacher, 2002). However, the enterprise start-up design could combine the win-win spiral and evolutionary models to reduce complexity.

iii) Component Based Development (CBD)

CBD provides solutions for building complex adaptive enterprise start-up systems in the internet era (Crnkovic & Larsson, 2002; Welke, 1994). One of the primary aims of CBD is to deal with increasing complexity and size of the business applications (Allen & Frost, 1998). To meet the challenges in rapidly changing domains and provide the basis of new techniques supporting the next generation of software intensive solutions, CBD presents the promising attempt (Brown, 2000). In literature, CBD presents several reasons that are relevant for service system development in dealing with complexity and possibility of shortening the development life cycle.

The CBD paradigm uses selection, reconfiguration, adaptation, assembling and deployment of encapsulated, replaceable, interoperable system rather than building the entire system from start (Brown, 2000; Clemens, 2000). Using CBD helps developers to manage changes better as it can be used effectively to localize changes inside single components and prevent uncontrolled propagation of changes through the system (Mulira, 2007; Veryard, 2001; Cheesman & Daniel, 2001). Reduce development and maintenance costs and increase productivity: using components to develop systems reduces development costs as it supports reuse of existing, developed and pre-testing components (Veryard, 2001). In addition, reuse of existing components can increase productivity since development does not always start from scratch (Cheesman & Daniel, 2001). CBD is agreeable to environments with stable and abundant technology resources but useful elements for reducing complexity in systems development that can be adopted for unreliable infrastructures and incompatible applications are still applicable.

Figure 2-2 presents summarized concepts and benefits of CBD.

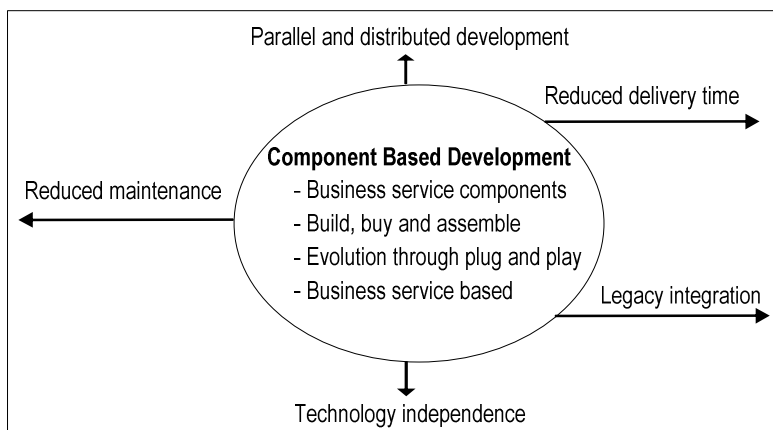


Figure 2-2: Concepts and Benefits of CBD (Source: Adapted from Sprott & Wilkes, 1999)

• Information systems design theories

Alter (2002) defined Information Systems as a work system whose business process is devoted to capturing, transmitting, storing, retrieving, manipulating and displaying information, thereby supporting other work systems. He identified communication systems which help people work together by interacting and sharing information in many different forms (Alter, 2002). When coming up with requirements for an information system, various ideas are generated by different users. Therefore, in the design phase of enterprise start-up services, the inclusion of users in an evolutionary approach is suitable in situations where the requirements are not well understood or formed by the users. An

evolutionary design approach consists of expanding increments of an operational product with the directions of evolutions being determined by experience. The challenge of this approach is to distinguish the operational product from the old code and fix model whose initial motivation was lack of planning for the waterfall model (Boehm, 1988). The waterfall and spiral model are two basic development models for information systems (Cadles & Yeates, 2001; Boehm, 1988). The water fall model is a stage by stage model; the spiral model combines this with an evolutionary approach giving a structured and incremental approach to the start-up designing process. The enterprise start-up design can start from the center of the spiral and progresses outwards (Van de Kar, 2010).

- **Service systems approach**

The service system approach represents an amalgamation of three components for effective service delivery and management: the service concepts, organizational network and technical architecture (Van de Kar & Verbraeck, 2008; Faber et al., 2003; Edvardsson & Olsson, 1996).

- i) The service concept is the strategy that a service uses to create value for its customers.
- ii) The appropriate organizational network should be in place to support the distributed service production from different stakeholders (inter-organizational) perspectives. It provides coordination between resources such as people and other resources in the enterprise start-up process.
- iii) The technical architectural structures the software, hardware and netware that enable service delivery.

The organizational network and technical architecture determine the actual service delivery. The service design process can start at any of the three aspects.

Figure 2-3 shows the service system positioned in an environment dominated by social, political, legal aspects, operational processes, economic aspects, and trends.

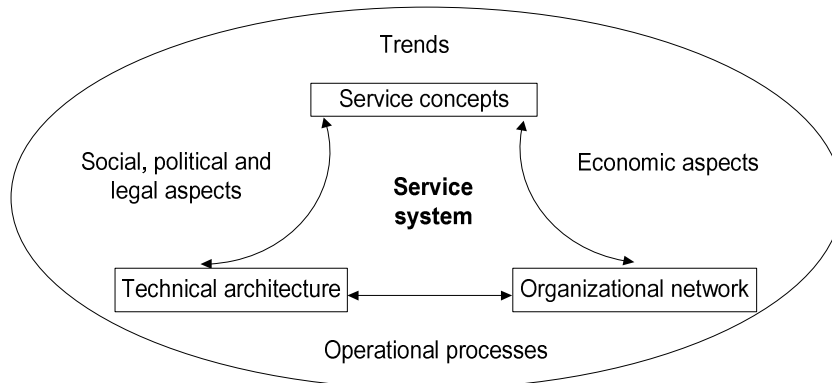


Figure 2-3: Service System Framework (Source: Adopted from Van de Kar & Verbraeck, 2008)

2.4 Decision Enhancement Services

Keen & Sol (2008) present Decision Enhancement Services (DES) as a paradigm in which the *studio* concept is introduced and defined as a facilitative, interactive environment for decision enhancement. The goal of a studio is to help managers rehearse the future by building confidence in directly using appropriate, interactive tools in the decision process. DES involves the fusion of tools, processes and people to make an informed decision (Keen & Sol, 2008). In order to realize enterprise start-up decision process agility, a studio contains services involved in exploring alternative ways of improving the enterprise start-up process.

According to Keen & Sol (2008), decision enhancement services comprise of four major aspects namely: decisions that matter, studios, suites, and stakeholders.

- *Decisions that matter*: These are issues, problems and challenges affecting the enterprise start-up decision process.
- *Studios* are facilitative environments, face-to-face links via telecommunication links that enhance active inclusion in building collaboration that is an intrinsic requirement for effective processes to handle decisions that matter. A studio has technology suites.
- *Suites* are packed with services that focus explicitly on enhancing the enterprise start-up decision process. To our case, the suites could provide visual representations of the mining enterprise start-up decision context and displays of outputs to best mesh how the people involved think and communicate. Suites targeted on enterprise start-up decisions that matter comprise of services to the people who make the decisions.
- *Stakeholders*: These are actors with skills, values, judgement and experience to make the enterprise start-up decisions.

Services for SME start-up enhancement

Translated to our case, there are five types of services for enterprise start-up decision enhancement, namely: landscaping, facilitation (orientation and initiation), recipes, suites and process (Keen & Sol, 2008).

- *Landscaping services* define the decision context, stakeholders and governance rules for the enterprise start-up decision process.

- *Facilitation services* ensure a team with the skills credibility and domain expertise to attract, motivate, coordinate and help the studio participants move to an enterprise start-up decision commitment.
- *Recipes* are services and specify ingredients that permit variation and innovation in the enterprise start-up decision process.
- *Suites* are sets of technologies packed with enterprise start-up services.
- *Processes* are the step-by-step procedures involved in starting an enterprise.

Figure 2-4 presents the services involved in the enterprise start-up Decision Enhancement Process.

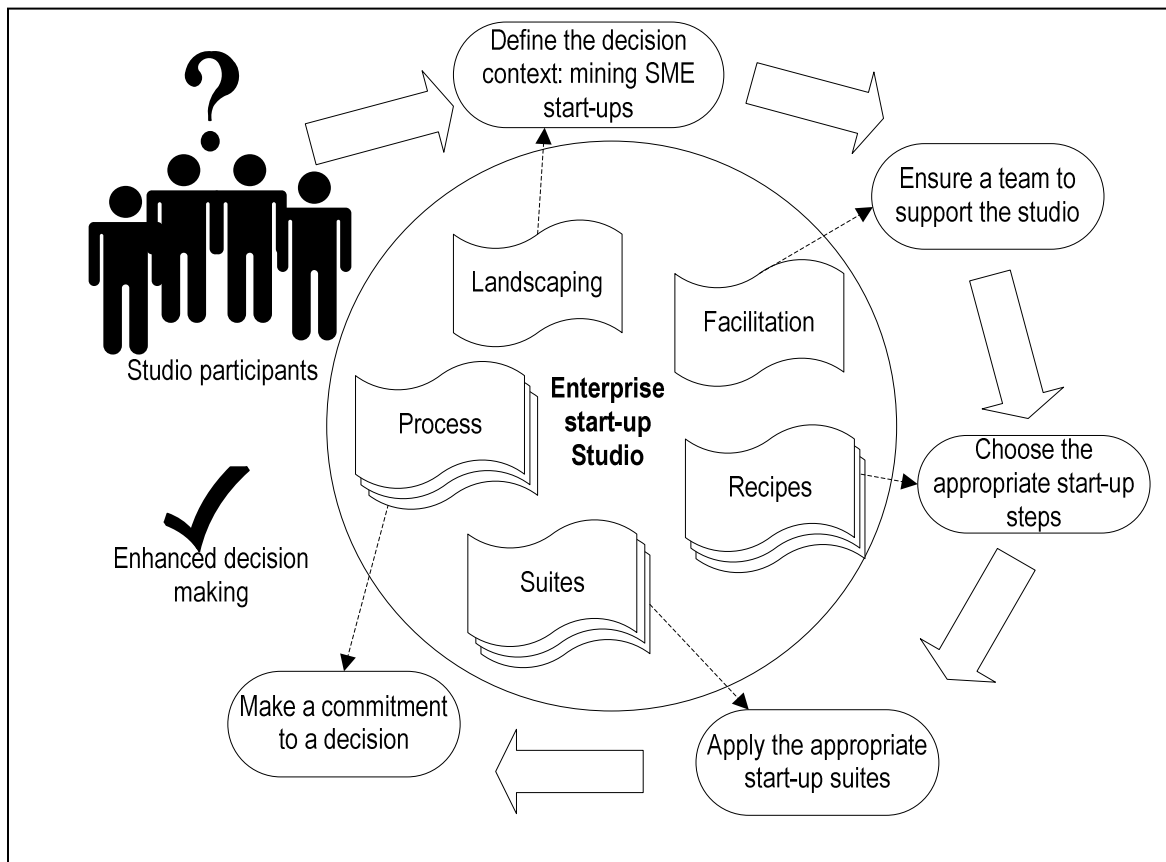


Figure 2-4: Decision Enhancement Process (Source: Adapted from Wang, 2007)

Studio styles

Keen & Sol (2008) mention three main studio styles: Learning, Inquiry and Participatory. The boundaries between the three are not fixed but each effective studio has one of these three styles (Keen & Sol, 2008).

- *Learning* studios are intended to help participants build a new understanding that leads to a new sense of options and processes. This is closely linked to gaming and many of the suites developed become vehicles for training, see for example the supply chain management portal in Laere (2003). In enterprise start-up decision processes, contextual suites would be developed to provide learning and training capabilities in a portal.
- *Inquiry* studios are more prescriptive in their focus and style. The goal is to foster critical inquiry, challenge assumptions and seek out original directions for the process, for example the urban planning Santa Fe studio (Churchman, 1971). Inquiry is vital in exploring alternative directions in the enterprise start-up decision process.
- *Participatory* studios are much more invitational and aim at encouraging involvement in the process that is most likely to lead to consensus, agreement and commitment. An example of this type of studio is the Hartsman studio presented by Keen & Sol (2008). Stakeholder involvement is vital in order to realize enterprise start-up decision agility.

Decision enhancement state of practice in developing countries

The studio based approach has been used in solving ill-structured problems in several fields in the Sub-Saharan region in Africa. There is growing evidence that the DES concept is working especially in developing countries as stated by Muniafu (2007), Mulira (2007), and Amiyu et al., (2012). Muniafu (2007) handled a complex situation of logistic brokering services in the rural areas of South Africa. The aim was to get a solution to conflicting interests of transportation parties by using ICT to provide support to logistic brokers in rural parts of South Africa. Mulira (2007) designed a studio that supported inter-organizational service systems in volatile contexts. The studio enhanced decision making within inter-organizational service systems among independent actors with diverse, technical infrastructure and scarce resources. Yonazi (2010) sought to enhance adoption of e-Government initiatives in Tanzania. Amiyu et al., (2012) aimed at handling a complex situation of increased demand for business process agility in organizations in Uganda.

DES is particularly suitable in developing countries because of its attributes of adaptive, agile, context dependant, flexible environment to enhance decisions, focusing on people that discuss solutions in their stakeholders (families, tribes and communities). DES improves on the communication problems among stakeholders with conflicting interests by making use of GSS. This allows the generation of

ideas in a non-biased way by creating consensus. The creation of improvement points are vital to the decision makers and draw their attention to neglected issues that matter to the enterprise (Keen & Sol, 2008). It enables stakeholders to flexibly explore alternatives that improve decisions in a manner that is adaptive and cost effective before committing to a particular choice (Keen & Sol, 2008). It is worth noting that a decision enhancement studio provides a plausible solution to handling the ill-structured decisions involved in starting up an enterprise in Uganda.

2.5 Conclusions

This chapter provides a theoretical background to help us define the relevant concepts for our enterprise start-up approach. Transaction cost economic theory and inter-organizational theories address the degree of transaction, complexity, site, physical, human assets, interdependency, trust and agreements (Williamson, 1999). Bureaucratic relations exist and there is a need for stakeholder involvement, coordination through exploration and exploitation of enterprise start-up alternatives (Nooteboom & Gilsing, 2004; Powell, 1990). Argyris (1999) argues that focusing on the characteristics of isolated transactions can be insufficient to explain the scope of the firm especially when transactions within the firm are interrelated. SET addresses the need for cooperation relationships, interdependency between stakeholders, interaction among individual and groups (Nabuuma, 2010; Lambe et al., 2001; Kern & Willcocks, 2000). Process management emphasizes stakeholder involvement, in handling urgent matters, openness, integrity and core interests (De Bruijn et al., 2002). Systems engineering looks at interrelations, controversial value judgments, multi-disciplinary, level of principles, product definition development and deployment, risk and uncertainties, fragmented decision making, human needs perspectives and resolution of issues at institutional level (Sage & Armstrong, 2000).

The researcher prefers to call this study to be opportunity driven since the design of mining enterprise start-ups is aimed at developing services for various enterprises within the same sector but with diverse user needs. The services will only be successful if they are useful and help to solve problems that meet the needs of the potential users in the rural areas. The motivation for designing mining SME start-up services is context driven. The entrepreneurs are interested in profit making as well as maintaining relationships with the legislative bodies in order to survive in the start-up process.

The SME start-up process is characterized by ill-structured problems where the entrepreneur uses adhoc mechanisms like intuition, six sense, guess work and chance to make a decision (Gielnik, 2010; UBOS, 2007; Walter et al., 2005). There is a need to enhance the enterprise start-up decision process by involving stakeholders in exploring alternatives in response to the dynamic environment. Dissolving a decision issue involves changing the nature and environment of the entity in which the problem is embedded. Technology offers a means by which the nature and environment of a problem can be altered in order to determine the conditions under which the issue can be resolved. Emphasis has been put on the use of experts to make decisions without the managers and owners involved. Therefore, there is a need for the fusion of the stakeholders, process and the technology for improved start-up decision processes (Heuberger, 2005; Simonsen & Perry, 1999). In absence of comprehensive integrated models and tools, incomplete decisions are faced in the SME start-up process.

Decision enhancement services are capable of improving start-up decision agility by creating opportunities for speedy, adaptive, and coordinated services among its participants (Keen & Sol, 2008). DES has the potential to provide support to the SME start-up decision process using its services. Landscaping involves using the regional service centers as the focal point for supporting mining SME start-up activities by the selected actors. Facilitation includes setting up a team to control the start-up activities and build consensus. The recipes in this case are the sets of steps involved in supporting the mining enterprise start-up process. The suites provide services that can be applied using the recipes in the SME start-up process. This is followed by making a commitment to the mining enterprise start-up decision process.

CHAPTER 3. STARTING A MINING SME IN UGANDA

3.1 A case study

This chapter presents an exploratory case study to derive mining SME start-up issues, problems and challenges. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context (Yin, 2003). The mining SME start-up exploratory case study was chosen to deepen our understanding of service development and to provide a preliminary evaluation of what can be done to enhance mining SME start-up services in rural areas. The exploratory study provides us with initial ideas on how to provide support to enhance the development of mining enterprise start-up services. Based on the case study criteria, Uganda was considered to be a suitable candidate for the study since this is a country that is striving to deliver ICT services to benefit rural communities as discussed in chapter one. This chapter presents the activities and results of the initiation phase of the study. The exploratory case study is the basis for designing and introducing an appropriate solution for SME start-up problems (Hevner & Chatterjee, 2010; Hevner, 2007).

3.2 Data collection approach

Uganda encompasses 112 districts (MoLG, 2011). The mining entrepreneurs were selected from the four regions of Uganda, namely: Central (Kampala, Masaka, Mubende, Wakiso, Mukono and Lyantonde), Eastern (Jinja), Western (Kasese, Kabarole, Bushenyi, Kabale, Kisoro, Mbarara, Ntungamo and Sheema districts) and Northern (Gulu). The DGSM has regional offices in Masaka, Entebbe, Tororo, Mbarara, Kabale, Jinja and Gulu districts which were important meeting centers with the mining entrepreneurs. The research focused on SMEs that mine the following minerals: limestone, clay, sand, quarry stones, vermiculite, gold, kaolin, pozzolana and salt.

The areas were selected because they are located in the rift valley where the majority of mining activities take place (Tuhumwire & Hinton, 2006; Yager, 2003; Orehmie, 2002; Mobbs, 1997; Rosenhahl, 1987; Barnes, 1961). This study was carried out during the time the Department of Geology Survey and Mines (DGSM) had the Sustainable Management of Mineral Resources Project (SMMRP) / Mineral Resources Management and Capacity Building Project (MRMCBP) (Kato, 2010; DGSM, 2009; Hinton et al., 2009). Participation in the SMMRP project provided an in-depth understanding of the key issues involved in mining enterprise start-ups.

Interviews and Focus Group Discussions (FGDs) were used to collect opinions and experiences from the respondents concerning mining SMEs. The data sources to elicit the information needed in this study included internal reports, documents from DGSM and the SMMRP conference held on March 10th – 14th 2009 (DGSM, 2009; Hinton, 2009). Interviews captured the respondents' personal accounts while FGDs were instrumental in revealing, discussing and clarifying issues and doubts. The average interview session lasted for an hour. Upon the consent of the respondents, interview guides were used for purposes of guiding the discussion (Appendix 1B).

During the focus group discussions, the participants were introduced to the research topic, its aim and the information required. Participants were then divided according to their regions for discussions. A focus group discussion guide was used for the sessions (Appendix 1A). This allowed the participants take part in the discussion with probing and openness of mind. Later a combined group discussion was convened where each group presented their views. This session lasted for two and a half hours. To ensure quality and reliability of the data, a summary of the interviews and focus group discussion was sent to respondents for verification of the results (Lincoln & Guba, 1985).

The quantitative data collected was coded and entered into Statistical Package for the Social Sciences (SPSS) version 17 for analysis. The responses were treated as ordinal variables and assigned codes according to the options in each question (Norusis, 2010). The aim of the quantitative results was to get the percentages of the respondents on the decision issues involved when starting a mining enterprise as shown in the various tables.

Qualitative data analysis followed the procedures of grounded theory (Strauss & Corbin, 1990). The three coding processes of grounded theory i.e. open coding, axial coding and selective coding was manually employed in data analysis. Despite being time-consuming, manual analysis enabled the researcher to take an active decision in the formulation of themes, and properties. Transcribing of interviews was conducted by the researcher in order to provide a wider understanding of mining entrepreneurs perspectives of the decision issues involved in starting a mining enterprise (Manson, 2006). This enabled the researcher to become familiar with the response from different interviewees before the actual data analysis began (Bryman, 2008). The qualitative analysis process for the mining entrepreneurs in this exploratory study involved the following. *Open coding* is the first phase of

grounded theory data analysis that involves developing themes from the transcribed data through microscopic line-by-line comparisons (Strauss, 1987). Through critical line-by-line data examination, 9 major themes emerged. These themes included mineral distribution, land availability, regulatory advice and licensing, mining plan creation, linking the mining entrepreneurs to the customers, financial analysis (investment decisions), coordinating start-up requests and responses between the service providers and mining entrepreneurs, external and institutional aspects and inadequate infrastructure as presented in figure 3-1. *Axial coding* was employed to systematically examine the themes developed and establish relationships during open coding. This process involved revisiting the already collected data to confirm emerging themes. On further analysis and re-examination of the themes already developed during open coding resulted in refinement of the previously developed themes. This process involved grouping the previously identified themes into 4 abstract themes; land acquisition, regulatory, pricing and communication as shown in figure 4-5. Consequently, all the previously identified items were then fitted into the four newly developed abstract themes. *Selective coding* involved establishing relationships between themes and sub-themes and organizing the sub-themes around one central theme.

Table 3-1 presents the following decision makers i.e. the mining entrepreneurs, consultants, DGSM representatives and potential miners involved in mining SME start-ups exploratory study (Norusis, 2010; Spiegel & Stephens, 2008).

Table 3-1: Respondents in the exploratory study

Category	Number of respondents	Percent (%)
Mining entrepreneurs	55	61.1
DGSM staff	5	5.6
Mining consultants	5	5.6
Potential miners	25	27.7
Total	90	100

The mining entrepreneurs involved in the study were classified according to the management responsibility as shown in Table 3-2. The research was interested in the senior management of mining enterprises who make start-up decisions.

Table 3-2: Management responsibility of respondents

Decision makers	Frequency	Percent (%)
Enterprise owners	40	72.7
Site managers	15	27.3
Total	55	100

During the case study, the respondents were introduced to the concept of ICT mining enterprise start-up services using storylines like mineral identification and communication examples. They were asked to identify some of the functionalities that would be desired in mining enterprise start-up service systems and point out the problems that face the development of the actual current mining enterprise start-up service system. Interviews with the mining consultants and mining DGSM staff were carried out before proceeding to the rural areas to collect data from the mining knowledge service centers, service providers and customers.

3.3 Results

The interviews with the DGSM mining experts and consultants show that the main challenge faced in developing mining enterprise start-up services was how to improve the coordination of the mining enterprise start-up process. The main causes of the problems were attributed to the internal factors (inaccessibility to mineral identification information, incomplete information on land cost and ownership, regulations, middlemen, mining plan, financial), external factors (environmental and institutional) to the rural masses. The interview sessions with the mining entrepreneurs, provided the following aspects.

a) Internal factors

Inaccessibility to mineral identification information

From the interview sessions it was clear that the miners face challenges of identifying mineral deposits due to lack of information. In cases where decisions were made on mineral locations, inadequate information on the quality and quantity of the remaining ore was available. To inquire about the respondents' awareness of the mining sites, mineral location and distribution, the mining entrepreneurs were asked how they carried out mineral exploration. The results presented in Table 3-3 show that the main mineral identification agents are family and friends.

Table 3-3: Mineral identification (exploration)

Mineral identification agents	Frequency	Percent (%)
DGSM	5	9.1
Family or friends (pitting)	45	81.8
Mining consultants / metallurgists	5	9.1
Total	55	100.0

Information on land cost and ownership issues

According to the Uganda mining act (2004), the minerals belong to the government but the land is owned by individuals. Therefore, it is necessary for entrepreneurs to obtain information on land ownership (Ministry of Lands and Urban Development, 2011). In the exploratory study, it was noted that the mining entrepreneurs lack information on alternative methods of land possession and costs involved. This affects the entrepreneurs start-up decision process thus the need for a structured way on disseminating procedures. Table 3-4 shows the various ways of obtaining or attaining land.

Table 3-4: Mine land acquisition or surface rights

Options	Frequency	Percent (%)
Bought the land	15	27.3
Lease land from land owner	10	18.2
Joint venture with land owner or customary owned land	30	54.5
Total	55	100.0

The legal process to acquire a mine

During the exploratory study, the researcher wanted to understand the problems associated with regulations in the mining sector. Here we sought to know whether the mining entrepreneurs had legally registered companies, obtained mining licenses, paid royalties, made returns to DGSM and whether they knew where to obtain that information. The study also sought to find out whether an environmental impact assessment had been done for the mining sites. Table 3-5 shows the feedback from the respondents.

Table 3-5: Need for regulatory services

Questions	Options	Frequency	Percent %
Do you have a mining licence? (Prospective licence, exclusive prospective licence, mining lease licence, mineral dealers licence).	Yes	5	9.1
	No	50	90.9
How did you access the licencing information?	Unlicensed	50	90.9
	Department of geology survey and mines	2	3.6
	Family or friends	1	1.8
	Mining consultants or metallurgists	2	3.6
Do you have an environmental impact assessment certificate?	Yes	5	9.1
	No	50	90.9

Linking mining entrepreneurs to customers by eliminating the middlemen

During the focus group discussions, problems associated with the middleman's involvement in the start-up process of linking the entrepreneur to the customers were raised. The middlemen play a vital role in the marketing of miners' products, and information distribution on land availability. The entrepreneur utilizes the middleman or broker which leads to reduction in profits. The middlemen essentially operate as a chain of dealers thereby introducing complexity in the transactions. Additionally, the dealers sometimes fail to remit the money to the entrepreneurs. Table 3-6 shows that the majority of the respondents face challenges as a result of middlemen at start-up.

Table 3-6: The middle man's and financial issues at start-up

Financial and middlemen issues at start-up	Options	Frequency	Percent (%)
Do you face challenges of obtaining and remitting loan to banks at start-up?	Yes	50	90.9
	No	5	9.1
Do you face challenges on coming up with investment analysis decisions like CBA and ROI analysis?	Yes	53	96.4
	No	2	3.64
Do you face challenges of increased costs as a result of middlemen at start-up?	Yes	50	90.9
	No	5	9.1

Regulatory inquiries

A mining plan is one of the pre-requisites for the license and bank loan acquisition. This involves issues on production, marketing, and mining method alternatives. Inquiries were made on whether the participants had an idea of what a mining plan was and what its contents were. Table 3-7 shows that the participants had inadequate information on coming up with a mining plan.

Table 3-7: Mining plan services

Questions	Options	Frequency	Percent (%)
Do you have a mining plan?	Yes	5	9.1
	No	50	90.9
Do you have adequate information on creating a mining plan?	Yes	5	9.1
	No	50	90.9
What type of mining is carried out at your mining site?	Surface mining (extraction of minerals near the surface)	35	63.6
	Underground mining (extraction of ore located vertically or horizontal tunnels into the ore body)	20	36.4
Is your mining enterprise mechanized or not?	Yes	1	1.8
	No	54	98.2
What mining method(s) do you use when extracting the ore?	Drilling	15	27.3
	Blasting	5	9.1
	Rock wedging	17	30.9
	Heating	17	30.9
	Hydraulic rock splitting	1	1.8
Do you cover or utilize any pits after mining?	Yes	35	63.6
	No	20	36.4
Do you have any piped metered water at your mining site?	Yes	5	9.1
	No	50	90.9
Do you use electricity at your mining site?	Yes	5	9.1
	No	50	90.9

Financial problems

In the exploratory study, clarification was made on the entrepreneurs' ability in financing, loan payment, cost benefit analysis and return on investment analysis. The mining entrepreneurs often get start-up financial loans from banks and micro-finance schemes. However, the entrepreneurs face problems of paying the loan and systematically counting the expenses in relation to the profits from mining

activities. The entrepreneurs attributed the financial decision problems to inadequate book keeping and operations were assumed to be profitable. The respondents showed concern for the need for guided procedures, stakeholder involvement and the use of appropriate tools and techniques to handle the complex financial decision problems. Table 3-6 displays the findings from the respondents on financial issues.

2. External factors

The interaction between the mining entrepreneurs and the service providers

In the exploratory study, we noted that there is inadequate interaction and communication between the mining entrepreneurs and the service providers as deduced from feedback presented in Table 3-8.

Table 3-8: Interaction between the entrepreneurs and the service providers

Question	Options	Frequency	Percent (%)
How did you identify the minerals?	Department of geology survey and mines	5	9.1
	Family or friends	45	81.8
	Mining consultants	5	9.1
Is your mining enterprise licensed?	Unlicensed (No)	50	90.9
	Licensed (Yes)	5	9.1
Of the 5% that had licensed mining enterprises. How did you access the licensing information?	Department of Geology Survey and Mines	2	3.6
	Family or friend	1	1.8
	Mining consultant or metallurgists	2	3.6

The study involved probing the participants on what kind of services would enhance the mining enterprise start-up process. The respondents indicated the services to include request for information, suggestions, complaints, follow-up and contacts. It was noted that in order for the mining enterprises to survive, it is necessary to get a cheap and effective way of service delivery and interaction with the service providers.

Access to services

The study involved understanding the role of ICT in the entrepreneur's day to day mining operations. Three questions were generated to seek the participants preferred mode of delivery of services, the levels of experience with ICT and its usage. Table 3-9 shows that the participants preferred to use ICT (mobile phone) as the mode of delivery.

Table 3-9: ICT access

Questions		Frequency	Percent %
How would you prefer to access information on mining enterprises?	Computers	10	18.2
	Mobile phone	34	61.8
	CD ROMS	11	20.0
Do you experience in using any of the following ICT services. (Select accordingly). 1 – Email, 2 – Web browsing, 3 – Voice (mobile or fixed line), 4 – SMS (mobile or website), 5 – ICT professional, 6 – None of the above, 7 – All of the above, 8 – 1 to 2 items, 9 – 3 to 4 items	All	1	1.8
	One to two items	50	90.9
	Three to four items	4	7.3
The level of my ICT usage skills are?	Low	39	70.9
	Moderate	11	20.0
	Good	4	7.3
	Proficient	1	1.8

Guidance

As the entrepreneurs started their businesses on trial and error mechanisms, experience and luck, the respondents mentioned the need for guidance in the mining enterprise start-up process. The entrepreneurs are mainly driven by the need to survive which explained why they need adequate guidance on mining SME procedures. In addition, the respondents noted that the cost of getting the guidance and start-up services could be affordable as the entrepreneurs' are not willing to pay for inquiry services.

Infrastructure for access to services

The respondents further noted that since most of the mining enterprises are based in rural areas, it is important to consider the infrastructural constraints on accessing services like voice and data networks. Based on the results in Table 3-8, the mining entrepreneurs had basic ICT skills. With the presence of

six mobile company operators in Uganda with affordable voice and text services, the mobile phone technology was noted to be the most accessible and cost effective ICT service.

Institutional aspects

Among the institutional aspects, we found that the provision of the start-up services were unclear and outdated. We explored in detail and found that the mining entrepreneurs do not trust or share information on the start-up process. We also learnt that there is a lot of dynamic activity with incidences of formal and informal dealings between the service providers and the mining entrepreneurs which makes it difficult to develop services in this area. In addition, the service providers cited lack of adequate bandwidth and computer literacy in providing services to the rural areas.

External challenges

The respondents mentioned external challenges that affect the mining SME start-up process. These included a) market demands and supply b) competitors c) international mineral prices d) foreign exchange rates e) high taxation from government f) political instability and g) world wide economic instability. These were not very significant in the performance of the firm. However they were considered as hindrances and constraints to the mining start-up activity outside the mining entrepreneur's control. It was noted that 85.5% of the respondents faced at least one of the seven factors and 14.5% none of the above.

Figure 3-1 shows a summary of the mining enterprise start-up decision issues based on the exploratory case which includes challenges of 1) mineral distribution 2) land availability 3) regulatory advice and licensing 4) mining plan creation 5) linking the mining entrepreneurs to the customers 6) financial analysis (investment decisions) and 7) coordinating start-up requests and responses between the service providers and mining entrepreneurs 8) external and institutional aspects 9) inadequate infrastructure.

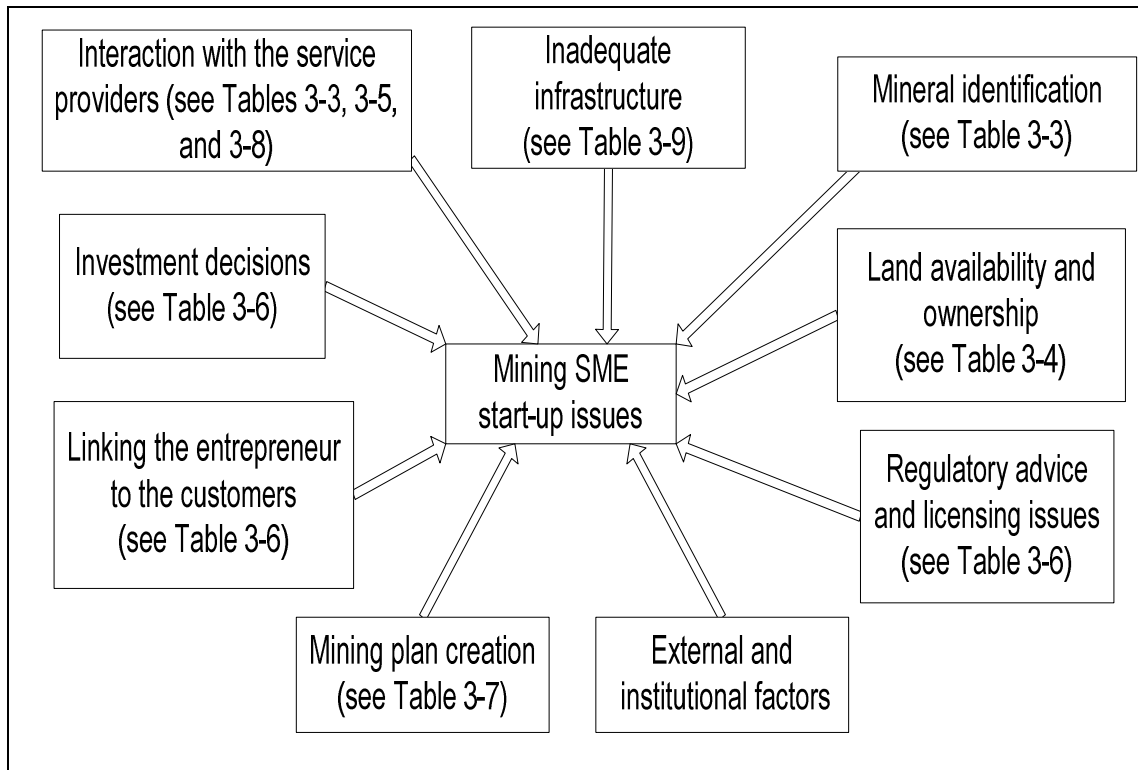


Figure 3-1: Issues Affecting Mining SME Start-ups in Uganda

Discussion

The mining SME start-up characteristics were derived from the data collected from the case study as presented in this section. The aim is to understand the mining enterprise start-up problems and how the current situation can be improved through the introduction of ICT services. In the case study we learnt that the mining SME start-up issues that need attention are related to the coordination between the service providers and entrepreneurs. Analyzing the findings presented in the previous section led us to state that SME start-up services need to consider the mentioned problems. The findings that influence the entrepreneurs start-up decision arises from the start-up problems derived from the case study, these include:

- Mineral identification problems lead to inaccurate estimation of mineral deposit and subsequent imprecise mineral location, quantity and quality start-up decision considerations.
- Lack of information on land availability. The mining entrepreneurs face challenges of accessibility to information on land with the required mineral and costs involved in land ownership. This results in inadequate start-up decisions in estimation of land acquisition costs.

- Regulation advice and licensing problems result into many SMEs not registering due to lack of information on procedures, how and where to access legal documentation within the start-up process.
- Lack of support in creating a mining plan. The mining entrepreneurs lack information on procedures and knowledge on how to create a mining plan which is a pre-requisite for starting a mining SME in Uganda.
- Linking the mining entrepreneurs to the customers. There is a need to improve on the communication linkage between entrepreneurs and the customers resulting into exploitation by the middlemen thus increased costs on marketing.
- The lack of support in financial analysis in the start-up process leads to inadequate cost benefit analysis and return on investment SME start-up decisions.
- Uncoordinated request and response between the service providers and entrepreneurs results in inefficient start-up service delivery. Inadequate communication between the service providers and consumers leads to lack of knowledge of who is doing what, where and when resulting in the need to travel long distances for start-up services incurring transportation costs for basic start-up services.

3.4 Start-up process implications

Implications for design

From the presented results we noted the following important aspects. The mining enterprise respondents revealed that they face challenges discussed in the above section. The implication of the case study revealed that solutions developed could provide support to improve the SME start-up problems. In this research, we state that mining SME start-up problems can be improved by providing solutions (services) that address the challenges. The idea of “services” has not been explored in improving SME start-ups, therefore there is potential for an appropriate approach. Enterprise start-up decision processes that lack agility and quality have a tremendous impact on SME start-ups. In situations where the current decision process is slow, inflexible, fragmented, conflicted, multiple unknown procedures and highly bureaucratic, chances of crisis and failure are high (Nooteboom & Gilsing, 2004; Sage & Armstrong, 2000; Powell, 1990). Keen & Sol (2008) argue that the enterprises that sustain success develop decision disciplines that are an integral part of their culture. There is need for systematic identification of the alternatives for SME start-up decision process improvement.

Based on the case study, we state that in designing a solution for the mining enterprise start-up process, two items need to be considered namely: coordination among stakeholders, and the mining enterprise start-up process dynamics.

- *Coordination among stakeholders*

In the case study, we discussed the fact that the mining entrepreneurs have inadequate information and knowledge on the SME start-up process. The mining SME start-up process is complex because it deals with multiple stakeholders e.g. service providers include: DGSM, National Environmental Management Authority (NEMA), National Forestry Authority (NFA), Uganda Wild-life Authority (UWA), Uganda Revenue Authority (URA), Ministry of Trade and Industry (MoTI), and Ministry of Lands and Urban Planning (MoLUP). A general finding from the exploratory study reveals that the availability of the DGSM regional service centers supported with services that meet the mining SME start-up needs is desirable. The challenge is to support the mining start-up services offered within the existing centers to cater for coordination among the multiple stakeholders. This implies a need for a systematic approach to stimulate and support the participation of the involved stakeholders.

- *Dynamics in the start-up process*

In the case study, we observed the dynamics involved in the mining SME start-up process. In the recent years, the DGSM has tried to make effort to support the start-up process. Technology is an enabler to change the way of working in the start-up process. This implies a need for innovation of the SME start-up activities. This may involve process and project management techniques to control the studio design (De Bruijn, 2002). The dynamics caused by technology implies the need for flexible and scalable solutions.

Implications for practice

One of the main objectives of conducting the exploratory study was to explore issues pertaining mining SME start-up services in rural areas and to determine how these services can be enhanced using ICT. The exploratory case study served to enrich our understanding of the rural mining SME start-up decision process. The section below describes the start-up process implications for practice derived from the exploratory case study and literature.

- *Limited insight into mining enterprise start-up process services:* Many of the rural mining entrepreneurs had fragmented, incomplete information and limited insight on the start-up process services that can be used. Therefore the mining enterprise start-up services could consider the needs of the local situation to support start-up services. The services could be simple and easy to use. To be of use, the mining enterprise start-up process services could contain location services of mineral distribution in an interactive manner to allow the entrepreneur explore various alternatives of mineral deposits. This could enable the entrepreneur determine the best quality mining site and alternative mining sites in case the deposits get depleted.
- *Security on service issues:* The entrepreneurs could confidently use the mining SME start-up services. This may include non-disclosure of financial status to the public or other competitors that may jeopardize the entrepreneurs' transactions.
- *Enable creation of services that add value to the start-up process:* The regional service managers could create and maintain mining enterprise start-up value added services. Adaptive technologies based on user behaviour and requirements, such as accessibility to the service, have to be considered in the design of flexible services. This could be achieved through the provision of tools that support compositions of mining enterprise start-up services. The solution could support the development of mining enterprise start-up services by direct manual access of services via an interface or a solution space (Muniafu & Van de Kar, 2009). The services could be accessed from any location where internet services are available to allow wide spread rural accessibility. The regional service centers could also avail these services and act as the major dispatch centers for direct access. In addition, the services could be free of charge because of the resource constrained group of rural mining entrepreneurs.
- *Provision of ICT training facilities:* The regional service centers could have basic training facilities to allow the rural communities access to mining enterprise start-up services which may pose a major problem. Some of the ICT services being offered to the rural areas include mobile banking offered by telecommunication service providers to the rural communities in Uganda. Therefore, there is a need to use the existing ICT to enable mining enterprise start-up service delivery with basic ICT training facilities.
- *Mobile phone coverage:* There are an increased number of mobile telecommunication companies in Uganda with affordable services to the rural communities. We found out that there is a high incidence of mobile phone ownership, coverage and usage in rural areas of Uganda and it is possible to deliver mining enterprise start-up services using this technology. According to Uganda

Communication Commission (UCC) there is an estimated mobile telephone subscription of 10.4 million in 2010 and 13.2 million people in 2011 with an estimated 24.9 million by 2015 (UCC, 2011). This clarifies the capability of the environment to handle such request and response services. The development of internet based services can be an advantage to the rural communities with voice and data network access. The servers could be located in areas where there is stable power supply like the regional service centers. The use of the mining enterprise start-up services can reduce the economic access barriers associated with distance.

- *Flexibility:* According to Muniafu (2007), services for rural enterprise managers should be flexible and reusable. Simon (1977) states that inflexible services create increased costs for example in the form of communication, and motivation towards achieving a goal. In this exploratory study, the mining SMEs in the rural areas had unique problems, thus developing flexible and reusable start-up services is desirable due to multiple stakeholder involvement.
- *Information quality:* The SME start-up challenges that surfaced strongly during the exploratory study were timely information dissemination on: mineral distribution, land acquisition issues, regulatory advice, mining plan development, linking the entrepreneurs to the customers, financial issues and communication services to handle interaction with the service providers. According to Gonzalez, (2010) information quality has the following attributes: accuracy (Kontogiannis, 1996), timeliness (Atoji, Koise, & Nishida, 2000), relevance (Adam et al., 2007), quantity (Atoji, et al., 2000), completeness (UBOS, 2007), format (Jenvald, Morin, & Kincaid, 2001), security (Kim, Sharman, Rao, & Upadhyaya, 2007) and consistency (Fisher & Kinma, 2001). Therefore when starting a mining enterprise, it is desirable to disseminate quality information that posses the mentioned characteristics.
- *Un-fragmented services:* The major components involved in the enterprise start-up decision process i.e. that is people; process and technology are often in isolation and treated discretely. Usually, the people that matter are left out and the process is left to experts (Heuberger, 2005). There is a need for stakeholder involvement in the start-up decision process. This is vital because the stakeholders involved usually have independent interests and opinions. To avoid gambling and discontentment in the decision process, it is necessary to have mutual understanding among the different parties. In order to view the enterprise as a whole, the solution could consider un-fragmented workable practical solutions when starting a mining enterprise.

Given the findings and challenges presented in the previous section, there is a case for developing mining SME start-up services that meet the respondents' needs. The ICT services would be used in improving coordination among the stakeholders in providing the start-up services within the regional service centers. Based on this background, the development of ICT mining SME start-up services would be better coordinated through the use of the regional service centers that handle the start-up services. This would make the start-up services using ICT an ideal solution. The use of ICT to enable mining enterprise start-up services is expected to bridge the gap between the problems and constraints observed in the case study. The resulting mining enterprise start-up services could provide value added services that solve the mining entrepreneurs problems identified. The mining enterprise start-up services could integrate the various key start-up needs into packages by utilizing existing services provided by the service providers for example mineral identification, mineral quality and quantity from DGSM.

Based on the exploratory study, we learnt that there are good practices in the current process like using the regional service centers. However, there is need to support the regional service centers by providing a systematic approach that can be used to improve the SME start-up process activities like process modelling, coordination among the stakeholders, and use of appropriate technology. Based on our view of decision enhancement services, as the basis for new solution, these items could be incorporated. In conclusion, the approach needs to provide direction as to how mining SME start-up decisions can be enhanced. Following this chapter is the mining SME start-ups design.

CHAPTER 4. A STUDIO FOR STARTING A MINING SME IN UGANDA

In this chapter we discuss the design studio for starting a mining SME in Uganda based on the start-up services. This builds on the start-up theories presented in chapter 2 and refined with the exploratory case study in chapter 3. The design for the mining start-up service is based on the four ways of framework. We first look at the way of thinking, followed by the way of controlling, the way of working and the way of modelling.

4.1 Design approach

A design approach can be appreciated by its four underlying “ways of” namely: way of thinking, way of controlling, way of working, and way of modelling (Seligmann, Wijers, & Sol, 1989; Sol, 1988). The way of thinking of an approach expresses the underlying philosophy. The way of controlling expresses the managerial aspects of the design approach. The way of working articulates the possibly compound tasks which must be performed to carry out a design process. The way of modelling refers to the modelling tasks and concepts suitable for modelling relevant aspects of the problem situation.

Figure 4-1 presents this framework.

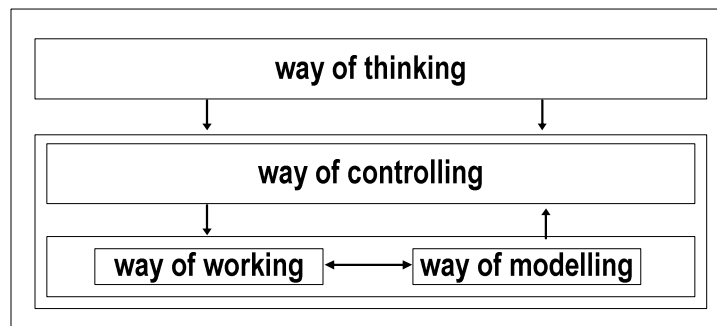


Figure 4-1: Framework to Analyse Design Approaches (Source: Sol, 1988)

Instead of a describing a design approach, we are using the framework to articulate our solution, where we depart from the literature reviewed and the exploratory case study.

4.2 Way of thinking

The way of thinking portrays the concepts and theoretical foundations for services to enhance mining SME start-ups. In order to resolve the mining SME start-up issues, (Keen & Sol, 2008) suggest the development of enterprise start-up services in a studio. A studio provides a common reference point for structuring the SME start-up decision process using appropriate technology and involving different

actors. The three major perspectives for enterprise start-up decision enhancement are based on an interaction of people, technology and process.

- The “*people*” aspect refers to the actors involved in the mining enterprise start-up process. People make decisions; their skills, values, judgement and experience shape the decision (Keen & Sol, 2008). Table 4-1 presents the actors i.e. the service providers (regional service center managers) and service consumers (mining entrepreneurs) and their roles in the enterprise start-up process.

Table 4-1: Actors in the enterprise start-up process

Actors	Role	Example
Service providers	Responsible for setting up and running enterprise start-up services.	DGSM regional service center manager
	To provide human resource support to those in need of enterprise start-up services.	Expert /consultant
	To make sure that the services work in the right way and deliver the relevant services.	Metallurgist
Service customers	To request for enterprise start-up services.	Mining entrepreneur
	To receive enterprise services.	Potential mining entrepreneur

- *Technology* provides the services necessary to realize the enterprise start-up process packed in suites. Technology provides multiple types and levels of support focused on enhancing the enterprise start-up process (Keen & Sol, 2008).
- The *processes* refer to the enterprise start-up decision processes which influence the likelihood of the actors to make effective decisions (Keen & Sol, 2008).

Decision enhancement services (DES) provide support for the four stages in the enterprise start-up decision processes. In the initial stage of generating ideas and opportunities, the studio provides a facilitative environment in which the actors using suites and guidelines collaboratively make alternative choices in the decision process. This applies to generating alternatives on market opportunity identification, information search, screening ideas for feasibility, identifying where to extract value and the development of products. In the triggering stage of enterprise start-up, decision enhancement

services provide decision alternatives to developing business plans, resource identification and resource acquisition. In the implementation stage, services are provided for managing the enterprise. In the growth step, decision enhancement services provide support to generate financial and other opportunities for expansion.

The regional service centers play a key role in the dissemination of mining enterprise start-up services to entrepreneurs. The centers envisage setting up and running the enterprise start-up services, providing human resource support to those in need of the enterprise start-up services and ensuring that the services work properly and deliver the relevant services. The regional service centers provide response services to the customers' requests and address the users' needs. Such services are not limited to maintaining and updating a database of the mining entrepreneurs and their required start-up services, but also provide coordination among the mining service providers and other actors.

4.3 Way of controlling

The *way of controlling* describes measures and methods for managing the SME start-up process (Sol, 1988). It consists of initiating i.e. forming a team and building consensus among the actors (Keen & Sol, 2008). The mining enterprise start-up control measures involve project and process management techniques (De Bruijn, 2002). Project management is a basic form of management used to control the development of mining enterprise start-up services (Ndagu & Obuobi, 2010). SME start-ups could be setup as a project with a specific, finite task to be accomplished by an arrangement of actors within a fixed time schedule and financial cost. This involves using the structures and governance rules of DGSM that could be followed in a flexible way to allow consensus and encourage participation reducing hindrance of open cooperation¹. DGSM provides governance rules. Other appropriate governance rules for sustainable enterprise start-up service development include: Service Level Agreements (SLA), performance indicators and business health checks.

In a multi-actor environment, it is important to consider process management to cater for coordination in the enterprise start-up decision process (De Bruijn, 2002). When considering supporting decision makers in a multi-actor environment, two aspects could arise in such a setting i.e. involving the relevant participants with specific roles, and using adaptive project and process management process.

¹ DGSM is the actor responsible for regulating the mining activities and provide mining start-up services to the communities in Uganda (DGSM, 2011).

- *Involving the relevant participants with specific roles*

To enhance the enterprise start-up decision process design, various actors are involved (see Table 4-1). It is important to ensure that the relevant participants with specific roles are targeted for involvement in improving the enterprise start-up process (Keen & Sol, 2008). This requires clear communication about the activities conducted at each stage. Coordination among the actors depends on the ability to understand and access the storyline using simple illustrations, therefore the need to involve the actors in the design process. In creating a coordinated setting for multi-actor interaction, joint activities such as exploring the problems, actor scanning, and fixing the rules should be considered (De Bruijn et al., 2002). SLA's should be considered when the actors express their intention to participate in the design process. It is also important to clarify public and confidential information in the early stages of the enterprise start-up design process.

- *Adaptive project and process management*

In project management it is assumed that problems and solutions are reasonably stable and that management technique (e.g. goals, time schedules and a fixed product) can be used (Ndagu & Obuobi, 2010). Process management focuses on identification and implementation of changes by creating a sense of urgency, integrity, openness, protection of core interest and values of the involved actors, incentives for continuation and process type arrangements to facilitate sufficient content (De Bruijn et al., 2002). Process management also helps the involved actors focus on agreements, meetings and negotiations (De Bruijn et al., 2002).

Adaptive strategies are appropriate for such enterprise start-up projects in multi-actor settings (Sol & Crosslin, 1992). In this strategy a design process is regarded as an adaptive process of learning for the actors involved in solving the SME start-up process (Sol & Crosslin, 1992). According to Sol & Crosslin (1992), an adaptive strategy is appropriate in balancing between project and process management techniques to handle the dynamic characteristics of the enterprise start-up process. This allows flexibility by not focusing on control and command but on innovation while enabling the actors to communicate efficiently with each other.

4.4 Way of working

The *way of working* specifies the steps taken to realize mining enterprise start-ups. Its focus is the understanding of the enterprise start-up problems through constant interaction with the application

domain within the regional service centers. To facilitate the development of mining enterprise start-up services using the desired approach, the users could carry out the following activities.

- **Service request and response:** This activity is used to carry out start-up request and response services in the enterprise start-up process. The idea behind this is that before one introduces a start-up service, there is a need to confirm that the service is required. This also enables the regional service manager and actors to coordinate the start-up services needed.
- **Maintain a catalogue of service providers:** This activity is important for enabling the mining entrepreneurs to know what service is carried out by each of the service providers. It is easier for the regional service managers to contact the service providers whenever needed. This enables the service providers to have a reference point for the service providers in order to add value and satisfy the entrepreneurs' start-up needs.
- **Coordinate the start-up services:** There are less coordination problems in the start-up process when using a single point of contact, in this case using the regional service centers, than without utilizing one. This activity is important when one considers the rural mining entrepreneurs unable to link to the national DGSM in Entebbe because of the economic challenges and distance issues. The mining entrepreneurs that need the start-up services are unable to reach the central national DGSM due to the increased transportation costs and time wasted involved. It becomes economical using the regional service centers intervention to coordinate the start-up services.
- **Link the mining entrepreneurs to the customers:** This activity is important for ensuring that the mining entrepreneurs locate the customers. The regional service centers keep a catalogue of the mining entrepreneurs with services to the customers. This enables the customers to identify the mining entrepreneurs with the service needed. This is helpful especially to the miners in rural areas with limited contacts to customers. The regional service centers could improve the service manager's role in coordinating the linkage role between the entrepreneurs and customers.
- **Communicate and facilitate the start-up feedback process:** This activity ensures that the enterprise start-up service response is carried out. Through this activity the service providers are informed of the services required and provide feedback to the entrepreneur. This activity enables communication both to and from the regional service managers and the stakeholders. This implies the need for stakeholder involvement in directed decision making on alternative mineral distribution, their quality and quantity. There is need for stakeholders to make informed decisions based on information on procedures and costs of land acquisition. There is a need to provide support in the linkage of entrepreneurs to the

customer in a transparent manner as a means of streamlining the middleman’s role. Therefore, there is a need for stakeholder involvement to support the mining plan decision process. The respondents showed concern for the need for guided procedures, stakeholder involvement and the use of appropriate tools and techniques to handle the complex financial decision problems. It was noted that there was inadequate interaction and communication between the mining entrepreneurs and the service providers as deduced from feedback.

Figure 4-2 presents a dataflow diagram of the mining enterprise start-up services².

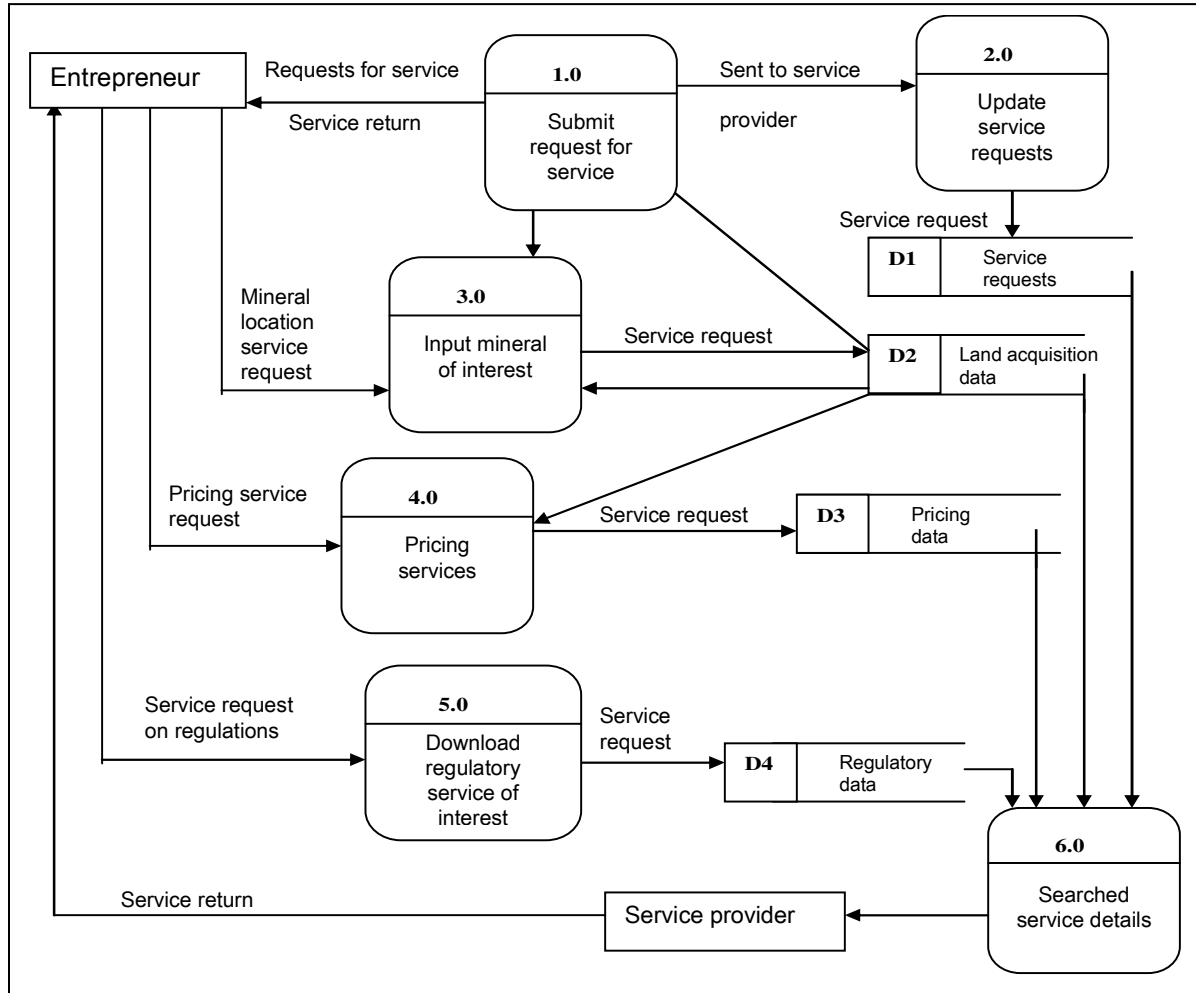


Figure 4-2: A Data Flow Diagram of the Mining Enterprise Start-up Services

In this research, the services consist of a number of activities for example; communication, land acquisition, regulatory and pricing services as described below. Activities are the sub- services comprised in a service for example identify mineral, create a mining plan, link entrepreneur to customer.

² The data flow symbols were adopted from (Gane & Sarson, 1977).

Figure 4-3 illustrates the enterprise start-up decision process using an activity diagram³.

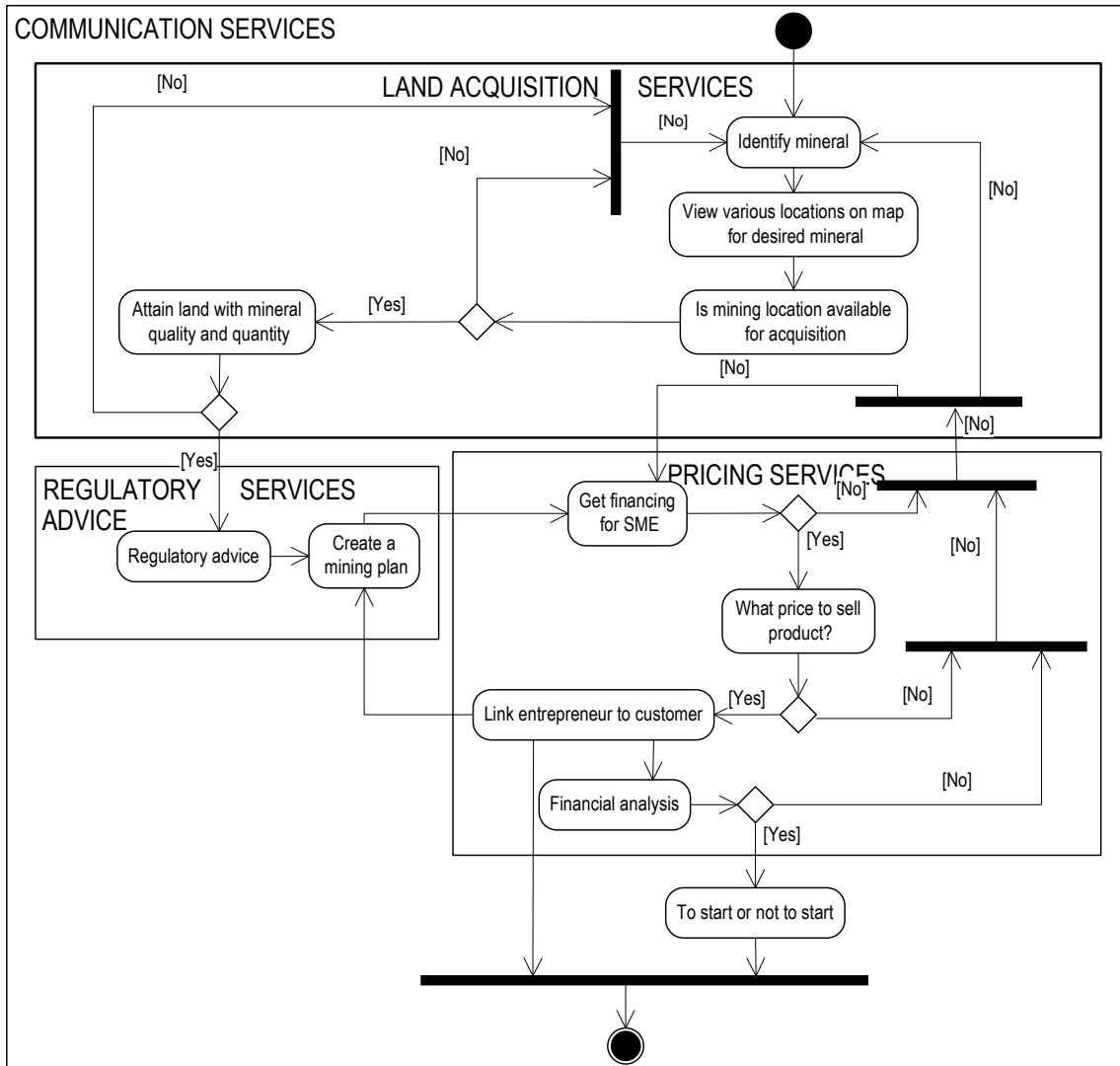


Figure 4-3: Mining Enterprise Start-up Process



- LAND ACQUISITION SERVICES:** The start-up process starts with the need for the mining entrepreneur to *identify a mineral*, and then plan to own land with the desired mineral. This involves viewing various locations where the desired mineral exists followed by an inquiry of the availability of land with the desired mineral quality and quantity. The output of land acquisition services provides inputs to the regulatory advice services. The regional service centers provide an interactive

³ An activity diagram shows the flow of control from activity to activity representing the enterprise start-up services (Booch et al., 1998)

environment for actor involvement during the enterprise start-up decision process of mineral identification, and mineral quality and quantity service specification.

- *REGULATORY ADVICE SERVICES*: Subsequently, the regulatory advice services involve identification of legal procedures and creation of a mining plan. The actors' play a key role in the decision process by providing for request and response on regulations, and mining plan creation service.
- *PRICING SERVICES*: The outputs of the regulatory advice services provide inputs to the pricing and financial analysis services. This is followed by identification of financing opportunities, identification of selling prices and linking to customers. The pricing and financial analysis services involve *the analysis of the enterprise costs as a basis for forecasting and making projections* of the business to be started. This provides inputs for financial analysis in calculating ROI and CBA ratios for forecasting and projecting start-up investment decisions. Subsequently actor involvement is needed when carrying out financial analysis within the start-up process. The pricing and financial analysis services enable the mining entrepreneur make an informed decision on how to start a mining enterprise.
- *COMMUNICATION SERVICES*: The intermediary services that cut across the services described above are the communication services that provide a means to support interaction between the mining entrepreneurs and the service providers.

The enterprise start-up recipes below address how to improve the mining enterprise start-up process in Uganda. The detailed recipes are presented in Table 4-2.

1. Develop a systematic way of identifying mineral distribution.
2. Ensure land availability by developing a land ownership strategy.
3. Ensure that regulations and policies are accessed and followed.
4. Support the development of a mining plan.
5. Consider elimination of the middleman by providing direct linkage among the stakeholders in the identification of markets, customers and competitors.
6. Support Cost Benefit Analysis (CBA) and Return On Investment (ROI) for projections and forecasts by giving an entrepreneur insights on investment decisions.
7. Clearly articulate the roles of the stakeholders in the communication and interaction in the mining enterprise start-up process. The multiple roles of the users should be flexible for the different user groups.

The section below presents the enterprise start-up recipes for enhancing the mining SME start-up process in Uganda. Table 4-2 shows the detailed recipes of how to improve the mining enterprise start-up process.

Table 4-2: Summary of the enhanced mining enterprise start-up decision recipes

Start-up recipes	Enterprise start-up recipes details
1. Develop a systematic way of identifying mineral distribution.	<p>Mineral identification services - How can the mineral identification process be enhanced?</p> <p>1.1 Generate, screen then select ideas 1.2 Identify a mineral of interest. 1.3 Search for mineral locations using Geographical Information System (GIS) tool. 1.4 Involve actors (communicate with regional service providers for mineral locations). 1.5 Ensure alternative nearest resources are known. 1.6 Establish the quality of the mineral deposits. 1.7 Ensure there is substantive ore (quantity). 1.8 Involve communication with region service providers on the grade of deposits. 1.9 Ensure continuous checking and discuss with business and mining experts. 1.10 Consultation with family and friends on various options. 1.11 Make a decision for mineral location based on the information and interaction with the tools, procedures and actors as above.</p>
2. Ensure land ownership by developing a land ownership strategy	<p>Land availability services - How can the land availability issue be improved?</p> <p>2.1 Determine the need for land – inquire whether one has land. 2.2 Establish the need to own land (buy, lease, joint venture) 2.3 Ensure that the land identified is the one of interest 2.4 If no - Identify mineral locations with mineral of interest in step 1 above 2.5 Inquire of land availability – if available proceed else return to step 2.6 2.6 Ensure communication with the service providers, and actors on land availability 2.7 Establish that the land available matches the mineral location identified 2.8 Identify the current ownership of land – communicate with actors and friends – lands database search by surveyor. 2.9 Use the land pricing and ownership sub-suite under the land acquisition suites. 2.10 Link the miner with the land owners 2.11 Agree on the amount required for the land of interest 2.12 Identify the required resources - Resource gathering – Communicate with money lending actors for terms and conditions that suit your need. 2.13 Process necessary documentation needed to attain the funds for purchase. 2.14 Ensure payment for the land (cash/ cheques) – evidence of payment - receipts, title, agreement, transfer. 2.15 Identify whether land is in rural or urban area. 2.16 Ensure the land is legally in the entrepreneurs or names? Legal ownership - plan for land survey (urban / rural). 2.17 Determine whether the land is in a rural or urban area. In cases where it is in the rural area follow procedure * (See details below); if in the urban area follow procedure ** (See details below). 2.18 Establish ownership (buy, lease, joint venture) then proceed to step 3. <i>* Rural Area procedures:</i> i). Adopt the regulatory suite – documentation for application forms below to be filled: a) Application for conversion from Customary Tenure to Freehold Tenure / grant of freehold (form (4)) b) Notice of Hearing of Application for Grant of Freehold – Public Notice form (10) c) The land Regulations – Demarcation form from Certificate of Customary Ownership form (23)</p>

Table 4-2: Summary of the enhanced mining enterprise start-up decision recipes

<p>2. Ensure land ownership by developing a land ownership strategy</p>	<p>Land availability services - How can the land availability issue be improved? Continuation</p> <hr/> <p>i) Ensure the neighbours confirm you as the true owner of the land. ii) Submit the forms to the district land boards with reports from the land committees ii) Ensure that the offer is collected from the land district office (Free hold) iii) Make sure the entrepreneur has applied from the land to be surveyed. (This can be done by the staff survey officer that gives instructions to a privately identified registered survey on the market) iv) Submit the forms to the district lands office which will send then to the head office in Entebbe. They plot the land on the national grid. v) Ensure the applicant picks up the deeds plan (map of land location). vi) Proceed to the land office (that is a request for free hold titles). They write to the lands commissioner through the land administrators' office to get free hold title. ** Urban Area procedures: Identify a private surveyor to locate the site with the land boards systems. 1. Submit the plan to the physical planners' office for demarcation of area in terms of roads. To be approved for the planning authority (if the road and other facilities are to their standards). The committee then writes to the commissioner in charge of land in the Ministry of Planning Lands and Survey (MoPLS) in Entebbe. 2. Ensure that the applicant picks up their deed plan that was issued (map of land location). 3. Consider using the regulatory suite documentation section for application using the land forms 4, 10 and 23 as listed below. Improved process description a) Application for conversion From Customary Tenure to Freehold Tenure / grant of freehold (form (4)). b) Notice of Hearing of Application for Grant of Freehold – Public Notice form (10) c) The land Regulations – Demarcation form from Certificate of Customary Ownership form (23) 4. Ensure that the neighbours confirm you are the true owner of the land. 5. Submit to the district land boards with reports from the are land committees An offer is given (Free hold)</p>
<p>3. Ensure that regulations and policies are accessed and followed.</p>	<p>Regulatory advice services- How to overcome the regulatory and licensing challenges?</p> <hr/> <p>3.1 Ensure the mining site has an environmental impact assessment certificate if not follow procedures 3.1.1 Involve National Environmental Management Authority (NEMA) officials in discussion in making the best option for assessment of mining site. 3.1.2 Send an invitation to the National Environmental Management Authority (NEMA) officials within your region for site evaluation to appreciate and advise the entrepreneur on the contentious issues/ concerns. 3.1.3 Organize a feasibility study proposal of the mining business clearly indicating how the mining will take place to what depth, what mitigation methods, covering of pits, construction, and operation details. By involving stakeholder expert participation. 3.1.4 Ensure that NEMA comes up with a list of private environmental assessment enterprises that have the facilities needed to assess you site based on what was on ground and what the feasibility study document. These may include some specialized with hydrologists and socialists. 3.1.5 Establish the terms of reference that have been designed and given to the miner showing the “to do” list of items by the management of the mining enterprise are followed. 3.1.6 Ensure the environment assessment firm submits a report to the mining enterprise and the NEMA offices of the findings. These may include issues on the soil samples, and water testing results. 3.1.7 Come up with a lead agenda of the content based on the assessment are set and as a result in case the enterprise meets the minimum standards as set in the term and conditions, an Environment Impact Assessment (EIA) certificate is awarded to the enterprise. 3.1.8 Make sure the EIA certificate, reviews of the terms and conditions are set for every 6months to make sure the mining enterprise complied with the agreed standards.</p>

Table 4-2: Summary of the enhanced mining enterprise start-up decision recipes

Start-up recipes	Enterprise start-up recipes details
<p>3. Ensure that regulations and policies are accessed and followed.</p>	<p>Regulatory advice services- How to overcome the regulatory and licensing challenges? <i>Continuation</i></p> <hr/> <p>3.1.9 Ensure that annual reports concerning the proposed mitigation concerns on the environment by the mining enterprise are written and sent out to NEMA.</p> <p>3.2 Ensure that the enterprise has a Memorandum of Understanding (MOU), Articles of Association (AOA) or constitution</p> <p>3.2.1 Involve legal practitioners in a discussion in making the best option for getting a customized MOU and AOA for the mining project.</p> <p>3.3 Register enterprise – Uganda Revenue Authority for Tax Identification Number (TIN).</p> <p>3.3.1 Involve communication with the URA service providers for procedure.</p> <p>3.4 Acquire mining license (Prospective Licence (PL) - 1 year, Exclusive Prospective Licence (EPL)- 1 year renewable, Mining Lease (ML) – 21 years, Mineral Dealers Licence (MDL) – 1 year</p> <p>3.4.1 Interaction with the regional mining service providers on mining license acquisition</p> <p>3.4.2 Adopt use of the documentation component in the regulatory section</p> <p>3.5 Ensure actor involvement in each of the regulatory processes.</p>
<p>4. Develop a mining plan</p>	<p>Mining plan creation services - How to support the mining plan creation problem?</p> <hr/> <p>4.1 Establish the need for a mining plan. If yes proceed to step 5. Otherwise follow steps below</p> <p>4.1.1 Ensure interaction with the geophysics service provider and other stakeholders for exact ore details.</p> <p>4.1.2 Ensure recipe 1 is fulfilled of identifying a mineral location, availability and quantity and quality</p> <p>4.2 Indicate the size of the mineral deposit (location licence size)? for example 1 acre</p> <p>4.2.1 Establish communication with the service providers who have the database of samples.</p> <p>4.3 Include the grade of the deposit in terms of percentages for example 15% of silica.</p> <p>4.3.1 Ensure communication with the service providers on mining methods</p> <p>4.4 Identify the method of mining to be used. For example surface mining, underground mining.</p> <p>4.4.1 Interact with the service providers on method to be used for the mining site.</p> <p>4.5 Indicate the ore extraction method to be used at the mine? For example drilling.</p> <p>4.6 Indicate the location of infrastructure (mill, mine waste, roads) length/ dimensions on site plan.</p> <p>4.6.1 Ensure communication with the service providers (human resource) experts on coming up with a human resource manual for a mining enterprise.</p> <p>4.7 Estimated the number of employees or work force needed, categorize them in three groups: (administrative, technical and contractors) and show an estimate of their salaries or weekly wages.</p> <p>4.7.1 Involve expert stakeholder participation in identifying the right equipment and machinery needed at mining site, its cost, and where they can be bought.</p> <p>4.8 Identify the equipment and machinery to be used at the mining site (estimate their cost).</p> <p>4.8.1 Ensure communicate with stakeholders in coming up with the production matrix</p> <p>4.8.2 Identify water and electricity or fuel utility strategies</p> <p>4.9 Estimate the level of production in a week, month and year in terms of tonnes.</p> <p>4.10 Estimate the taxes and royalties involved.</p> <p>4.11 Ensure a detailed financial manual is created showing the budgets, and balance sheets.</p> <p>4.11.1 Involve stakeholder communication especially financial analysts and experts. Also refer to section 6.0</p> <p>4.12 Develop a sustainable marketing strategy to handle the demand and sales</p> <p>a) Identify the previous, current and future possible markets</p> <p>b) Review changes in market share, leadership, market shifts, costs, pricing, competition</p> <p>c) Describe product being marketed</p>

Table 4-2: Summary of the enhanced mining enterprise start-up decision recipes

Start-up Recipes	Enterprise start-up recipes details
4. Develop a mining plan	<p data-bbox="407 359 1399 401">Mining plan creation services - How to support the mining plan creation problem? Continuation</p> <ul style="list-style-type: none"> <li data-bbox="407 422 1399 453">d) Identify competitors dealing with the same products <li data-bbox="407 453 1399 485">e) Provide an overview of product competitors, their strengths and weaknesses <li data-bbox="407 485 1399 537">f) Identify the distinctly or unique feature that defines the product in its market and against that of other competitors. <li data-bbox="407 537 1399 569">g) Identify a statement that summaries the benefit of the product service to the consumer <li data-bbox="407 569 1399 632">h) Establish communication strategies between the audience / customers and the enterprise like messaging, and contacts <li data-bbox="407 632 1399 663">i) Identify the possible product packaging material and costs <li data-bbox="407 663 1399 695">j) Determine the cost of goods and summarize the cost of materials <li data-bbox="407 695 1399 758">k) Establish a launching, adverting, promotion or branding strategy by identifying the costs involved and materials needed. <li data-bbox="407 758 1399 821">l) Determine a public relations strategy and costs of publicity items like editorial calendars, speaking engagements, conference schedules, etc. <li data-bbox="407 821 1399 852">m) Involve stakeholders in identifying all items mentioned above <li data-bbox="407 852 1399 884">n) Determine the distribution strategy and show the plan in terms of pie chart for comparison purposes. <li data-bbox="407 884 1399 947">o) Identify the success metrics or performance indicators by sets goals and means of measurements of each goal. <li data-bbox="407 947 1399 978">p) Plan for periodic business health checks <p data-bbox="407 978 1399 1010"><i>4.13 Ensure you have a production strategy</i></p> <p data-bbox="407 1010 1399 1041">4.13.1 Establish a strategy for sustainable fuel supply – firewood</p> <p data-bbox="407 1041 1399 1094">4.13.2 Establish a utility resource strategy that is a water management strategy for either (Urban / rural) areas. Since mining is mainly in rural areas follow procedures below.</p> <ol style="list-style-type: none"> <li data-bbox="407 1094 1399 1157">1. Identify businesses and residents that are in need of water. Apply as a group through their local council chairpersons to the district Ministry of Water and Environment for water. <li data-bbox="407 1157 1399 1241">2. Ensure that a needs assessment is carried out by the water engineers and workers from the head quarters of the region. They consider areas with at least 500 people who are willing to avail land for an office (water kiosk) and where to put the water station or source for other residents. <li data-bbox="407 1241 1399 1304">3. Identify clean water sources e.g. HIMA no clean water so the Ministry of Water and Environment identified a clean water source at River Yerya in fortportal). <li data-bbox="407 1304 1399 1367">4. Estimate costs involved. The professionals calculate the cost involved for such a project. Contracts are awarded to pre-qualified companies who then be funded to connect that rural area. <li data-bbox="407 1367 1399 1451">5. Identify residents and business that qualify for free metering and pipe lying. Funding is available for residents and businesses within 50 meters from the central point of the water offices. Beyond that 5,000 UGX is paid for every extra meter. <li data-bbox="407 1451 1399 1514">6. Establish a water board committee at the town council/ sub county or district to over see the water payments of 500/= per month or 1/= per litre (Varies from place to place) <li data-bbox="407 1514 1399 1598">7. Determine the nearest umbrella organizations set up in the four regions of Uganda to carry out maintenance of these government water services to the rural areas namely: South West Umbrella of Water and Sanitation – Head offices in Kabale district. Mid- Western Umbrella of Water and Sanitation head offices in Kyenkjojo. Eastern Umbrella of Water and Sanitation – Head offices in Mbale district. Northern Umbrella of Water and Sanitation – head offices in Gulu district. <p data-bbox="407 1703 1399 1755">4.13.3 Develop an electricity strategy by first determining the need either domestic or commercial services:</p> <ol style="list-style-type: none"> <li data-bbox="407 1766 1399 1797">1. Ensure the premises have a wiring certificate <li data-bbox="407 1797 1399 1829">2. Ensure that a copy of either a land title or sales agreement is availed on application <li data-bbox="407 1829 1399 1871">3. Attach a copy of a valid identity card/ voter's card or driving permit i.e. Local Council (LC) or residence cards are acceptable.

Table 4-2: Summary of the enhanced mining enterprise start-up decision recipes

Start-up recipes	Enterprise start-up recipe details
4. Develop a mining plan	<p>Mining plan creation services - How to support the mining plan creation problem? Continuation</p> <hr/> <p>4. Include one passport size photograph of the applicant 5. Ensure that a hand drawn sketch map (drawn by customer) is handed in on application 6. Make sure that the corresponding fees are paid with evidence of an original receipt inspection fee – 41,300/= (Domestic) - 88,500/= (Three Phase) - 118,000/= (KVA) 7. Include the applicants contact number</p> <p><i>For companies</i></p> <p>1. Ensure the premises have a wiring certificate 2. Ensure that a copy of either a land title or sales agreement is availed on application 3. Make sure that a headed stamped application letter from the company is attached. 4. Make sure the companies Tax Identification Number (TIN) is handed in 5. Make sure that the corresponding fees are paid with evidence of an original receipt Inspection fee – 41,300/= (Domestic) - 47,200/= (Commercial) - 88,500/= (Three Phase) - 118,000/= (KVA) 6. A hand drawn sketch map (drawn by customer) 7. Contact number 8. Estimate the costs involved I using the connection fee list below</p> <p><i>Connection fees</i></p> <p>1. Single phase – Domestic – 198,000/= (Capital Contribution and Security Deposit) 2. Single phase –Commercial – 298,000/= (Capital Contribution and Security Deposit) 3. One pole service (domestic) – 426,000/= (Capital Contribution and Security Deposit) 4. One pole service (Commercial) – 526,000/= (Capital Contribution and Security Deposit). 5. More than 1 pole service, three phase, KVA and Schemes:- Costing is done at head office in Kampala – Toll free number – 0800185186 or 185 There application form will be given to you which will be filed in by the applicant. 4.13.4 Identify sustainable alternative water and electricity (fuel) sources. 4.14 Ensure stakeholder involvement in the identification process for water and fuel sustainable resources.</p>
5. Recognize the different roles of service consumers and service providers in order to provide direct linkage.	<p>Pricing services – How to provide direct linkage of suppliers to consumers?</p> <hr/> <p>5.1 Identify the need for the service 5.2 Ensure stakeholder involvement in identifying the service needed 5.3 Adopt usage of the pricing suite to get contacts and details of available services 5.4 Involve stakeholders in identifying the best service 5.5 Identify the miners with the service they provide 5.6 Register the miners products in the pricing suite 5.7 Ensure communication with the consumers on the alternatives 5.8 Match the customer’s need with the miners (service providers) service 5.9 Involve stakeholders in the linking process. 5.10 Ensure communication of the best alternative</p>

Table 4-2: Summary of the enhanced mining enterprise start-up decision recipes

Start-up recipes	Enterprise start-up recipe details
6. Develop a financial analysis strategy for projection and forecasting.	<p>Financial analysis service – How to support the financial analysis challenges?</p> <p>6.1 Identify then determine the source of funding</p> <p>6.1.1 Involve stakeholders in identifying the sources of funds.</p> <p>6.1.2 Adopt using a financial package to get an idea of the items needed and fill them in.</p> <p>6.1.3 Ensure good practices of book keeping are used in recording sources of funding.</p> <p>6.1.4 Identify all funding agencies and their terms of reference like banks.</p> <p>6.2 Determine expenditure items. These will be used as the expenses.</p> <p>6.2.1 Interact with stakeholders in identifying the expenditures</p> <p>6.2.2 Adopt using a financial package to get an idea of the items needed and fill them in.</p> <p>6.2.3 Ensure good practices of book keeping for all expenditures are maintained.</p> <p>6.3 Determine the difference of the expenses from the revenues is the company's profit</p> <p>6.3.1 Adopt using financial packages and calculators to get the difference</p> <p>6.3.2 Involve stakeholder experts in interpretation of the differences and their impact on the enterprise.</p> <p>6.6.1 Build a base case financial model</p> <p>a) Estimate the Timing and magnitude of Future Cash Inflows and Outflows:</p> <ul style="list-style-type: none"> - Development cost (all remaining design, testing, and refinement costs up to production ramp-up). - Ramp-up cost - Marketing and support cost. - Production cost - Sales revenues <p>6.6.2 Perform a sensitivity analysis to understand the relationships between financial success and the key assumptions and variables of the model.</p> <p>a) Identify then determine the internal factors that affect the product development project. These may include the following items</p> <ul style="list-style-type: none"> • Development expense: investigation cost, development cost. • Development Speed Investigation time • Development time • Production Cost • Product performance <p>b) Identify the external factors these may include:</p> <ul style="list-style-type: none"> • Product Price • Sales Volumes • Competitive Environment <p>c) Make incremental changes to development cost while holding other factors constant, we can see the incremental impact on project profits.</p> <p>d) Involve stakeholders in identifying internal and external factors and interpretations during the sensitivity analysis phase of financial analysis.</p> <p>6.6.3 Use the sensitivity analysis to understand project trade-offs</p> <p>a) Understand the trade off rules (The near linearity of many sensitivity analyses allows the team to compute some trade-off rules to inform day-to-day decision making. These rules take the form of the cost per unit change in the internal and external factors. For example, what is the cost of a one-month delay in development time? What is the cost of a 0.1% development budget overrun? What is the cost of a \$1per unit increase in mining cost?)</p> <p>6.4 Ensure that the difference is positive then the business is viable otherwise if negative the business is not viable.</p> <p>6.5 Adopt the usage of accounting tools in developing timely: Profit and loss account, Balance sheet, Income statements</p>

Table 4-2: Summary of the enhanced mining enterprise start-up decision recipes

Start-up recipes	Enterprise start-up recipe details
6. Develop a financial analysis strategy for projection and forecasting.	<p>Financial analysis service – How to support the financial analysis challenges? Continuation</p> <p>6.6 Develop a projection strategy (cash flow analysis) 6.7 Involve the financial analysis experts and management of business. 6.8 Engage communication to and from family, mining consultants, accounts experts, bankers –loans section. 6.9 Ensure continuous business health checks on business progress. 6.10 Expand your business initiatives 6.11 Involve business advisory and counseling experts</p>
7. Clearly articulate the roles of the stakeholders in the communication and interaction in the mining enterprise start-up process.	<p>Communication service. How to support communication between miners and service providers?</p> <p>7.1 Identify the service needed by the miner. 7.2 Involve actors in guided identification process. 7.3 Identify service alternatives needed by the miner. 7.4 Adopt using the communication suites to access the service providers. 7.5 Get feedback to the customer / miner. 7.6 Ensure continuous check with the service provide for feedback. 7.7 Make sure feedback is satisfactory. 7.8 Ensure the miners' needs are met.</p>

4.5 Way of modelling

The way of modelling refers to the suites consisting of services needed to enhance the start-up decision process.

The Figure 4-4 presents an overview of the Mining Enterprise Start-up Studio showing the interaction among the services packed in the suites.

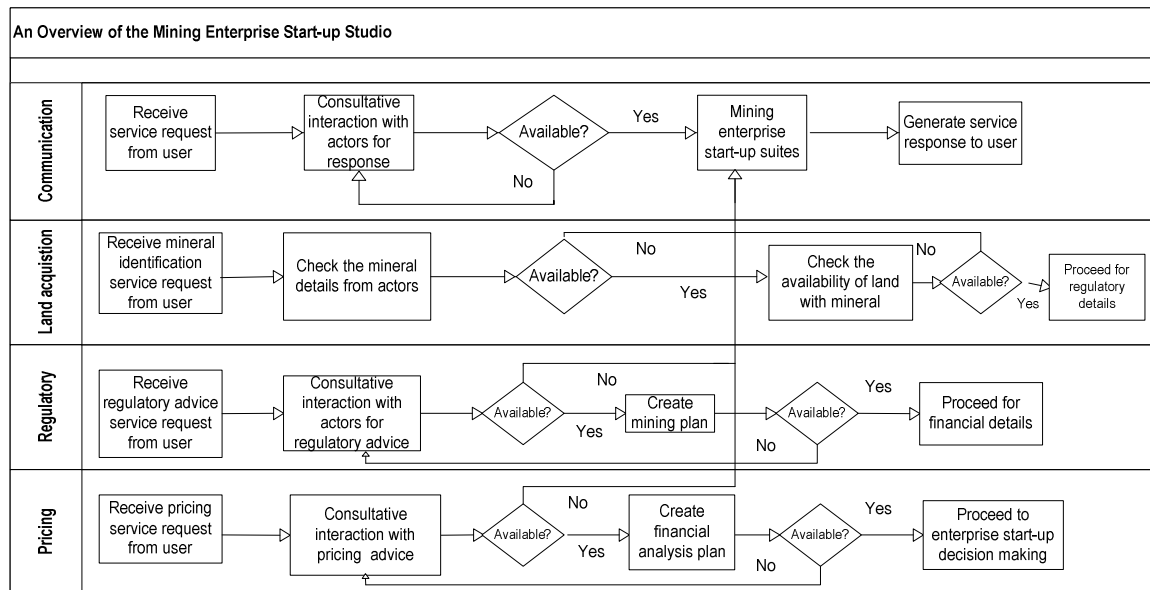


Figure 4-4: An Overview of the Mining Enterprise Start-up Studio

The Communication Suite allows the users to submit request for services to the actors that identify the users need through consultative interaction amongst the actors. In case the solution is available the actors proceed to the suites for further support after which responses are provided to the user. The Land Acquisition Suite allows the user to identify mineral locations through interaction then access the mineral identification sub-suite on the exact location after which the land availability is checked from the land acquisition suite to enhance their decision process. The Regulatory Advice Suite comprises of regulatory advice by consultative interactions with the actors who identify the required regulations then proceed to the Regulatory Suite for further regulatory details that may be useful in creating a mining plan. This is followed by the pricing suite that provides linkage of the entrepreneurs to the customer. The pricing request service is sent to the actors who consultatively identify the pricing details needs and proceed to the Pricing Suite for pricing support after which financial details are needed. The actors jointly come-up with financial analysis details after which the decision making process is made by the entrepreneur having improved the start-up process needs.

This Figure 4-5 presents the Mining Enterprise Start-up Suites namely: land acquisition, regulatory, pricing and communication. The links in the diagram below represent the following⁴.

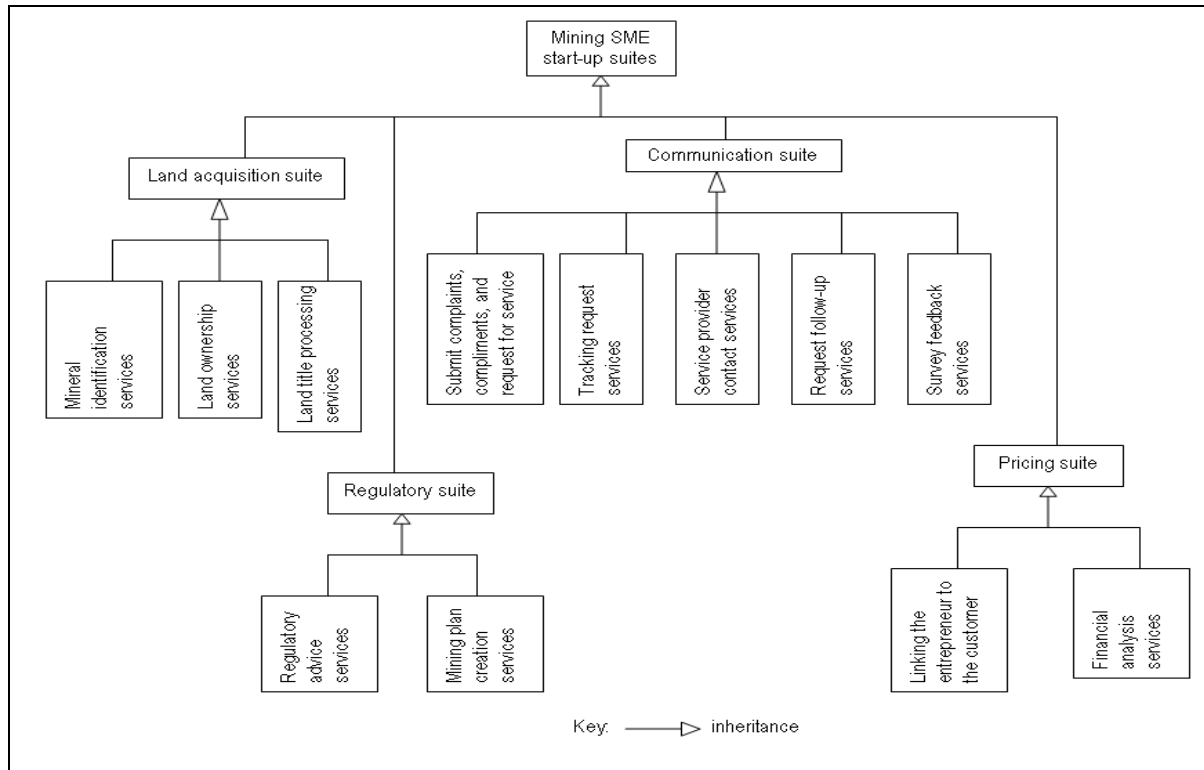


Figure 4-5: Mining Enterprise Start-up Services in the Suites

⁴ The links show an inheritance relationship among the mining SME start-up suites and services.

The inheritance links in Figure 4-5 are based on the Unified Modelling Language (UML) notation which shows the parent-to-child relationship among the services in the suites (Cheesman & Daniel, 2000). There are 4 mining SME start-up suites; land acquisition, regulatory, communication and the pricing suites. The land acquisition suite contains 3 services; mineral identification, land ownership and land title processing services. The regulatory suite encompasses 2 services; regulatory advice and mining plan creation services. The communication suite includes 5 services; submit complaints, compliments, and request for service, tracking requests, service provider contact services, request for follow-up services and survey feedback services. The pricing suite consists of 2 services; linking the entrepreneur to the customer, financial analysis services.

Land Acquisition Suite

The Land Acquisition Suite is responsible for enabling mineral identification and land ownership by providing mineral deposit location and land availability services.

Figure 4-6 presents the overview of the Land Acquisition Suite.

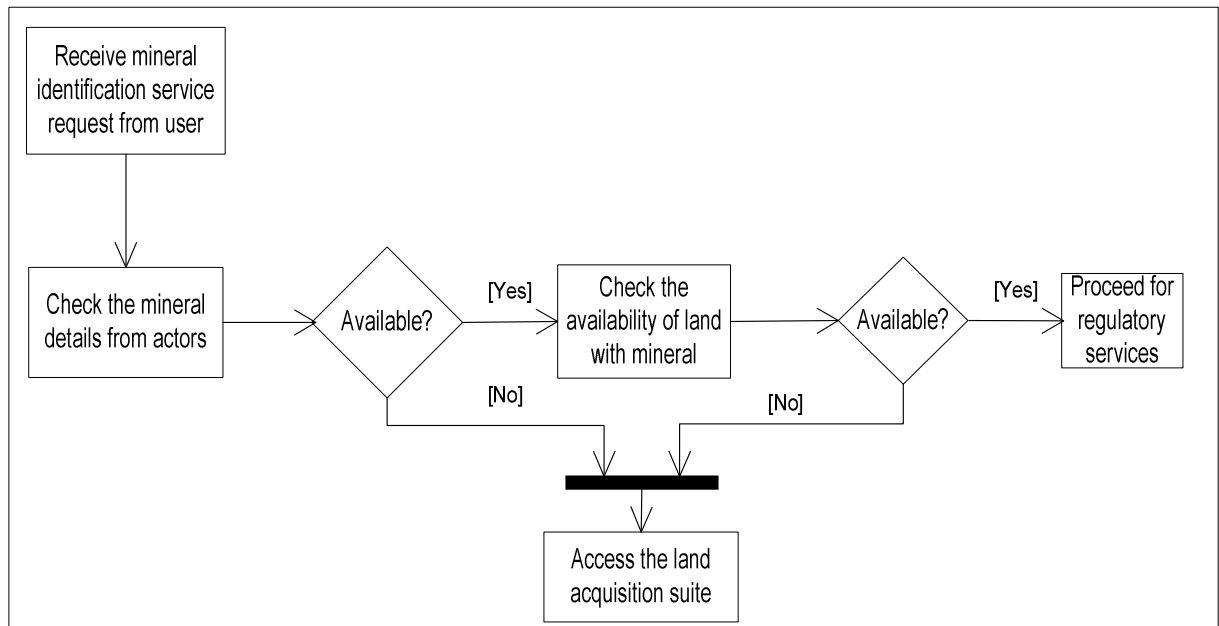


Figure 4-6: Land Acquisition Suite Overview

Mineral Identification Sub-suite in the Land Acquisition Suite

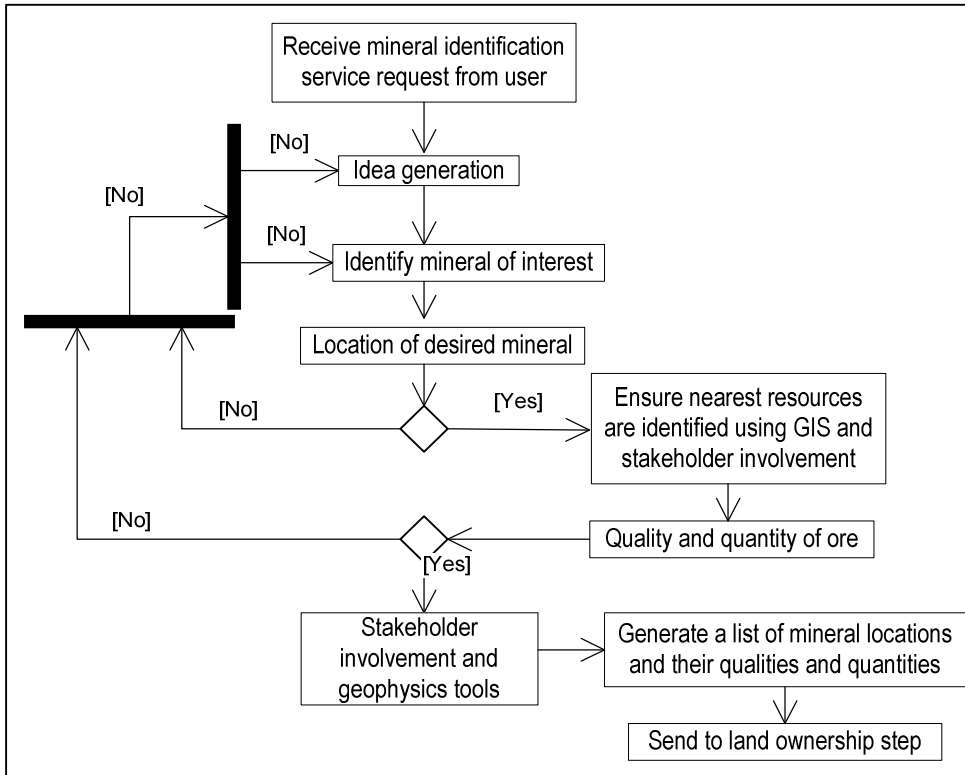


Figure 4-7: Mineral Identification Sub-suite in the Land Acquisition Suite

Figure 4-7 illustrates the Mineral Identification Sub-suite in the Land Acquisition Suite.

The mineral distribution identification process starts by generating ideas on a mining enterprise then identifying a mineral of interest. In case the mineral locations are known then we proceed to inquire on the quantity and quality of the mineral. In situations where the mineral locations are not known, the actors use the Geographical Information System (GIS) to identify the accurate location of the mineral. On identifying the mineral location, the quality and quantity of the mineral deposit can be achieved by involving actors. The combination of appropriate tools and involving actors in the mineral identification and land ownership start-up process form the proposed procedures to guide a mining entrepreneur make an informed decision.

Land Ownership Sub-suite in the Land Acquisition Suite

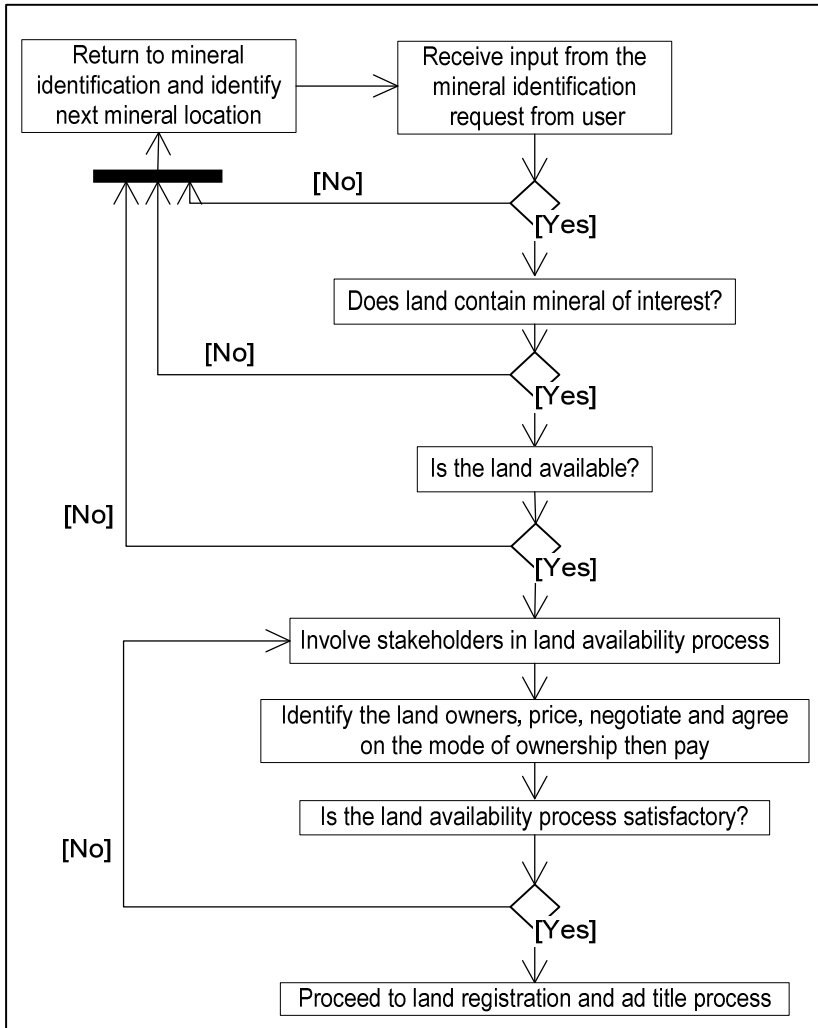


Figure 4-8: Land Ownership Sub-suite in the Land Acquisition Suite

Figure 4-8 presents the Land Ownership Sub-suite in the Land Acquisition Suite.

In cases where the entrepreneur requires land, there is need to inquire of the Land Ownership process. This is supported by the land availability service and interaction among the actors. On identifying the land owner and establishing contacts, the price is agreed upon and payments are made.

Land Registration and Title Sub-suite in the Land Acquisition Suite

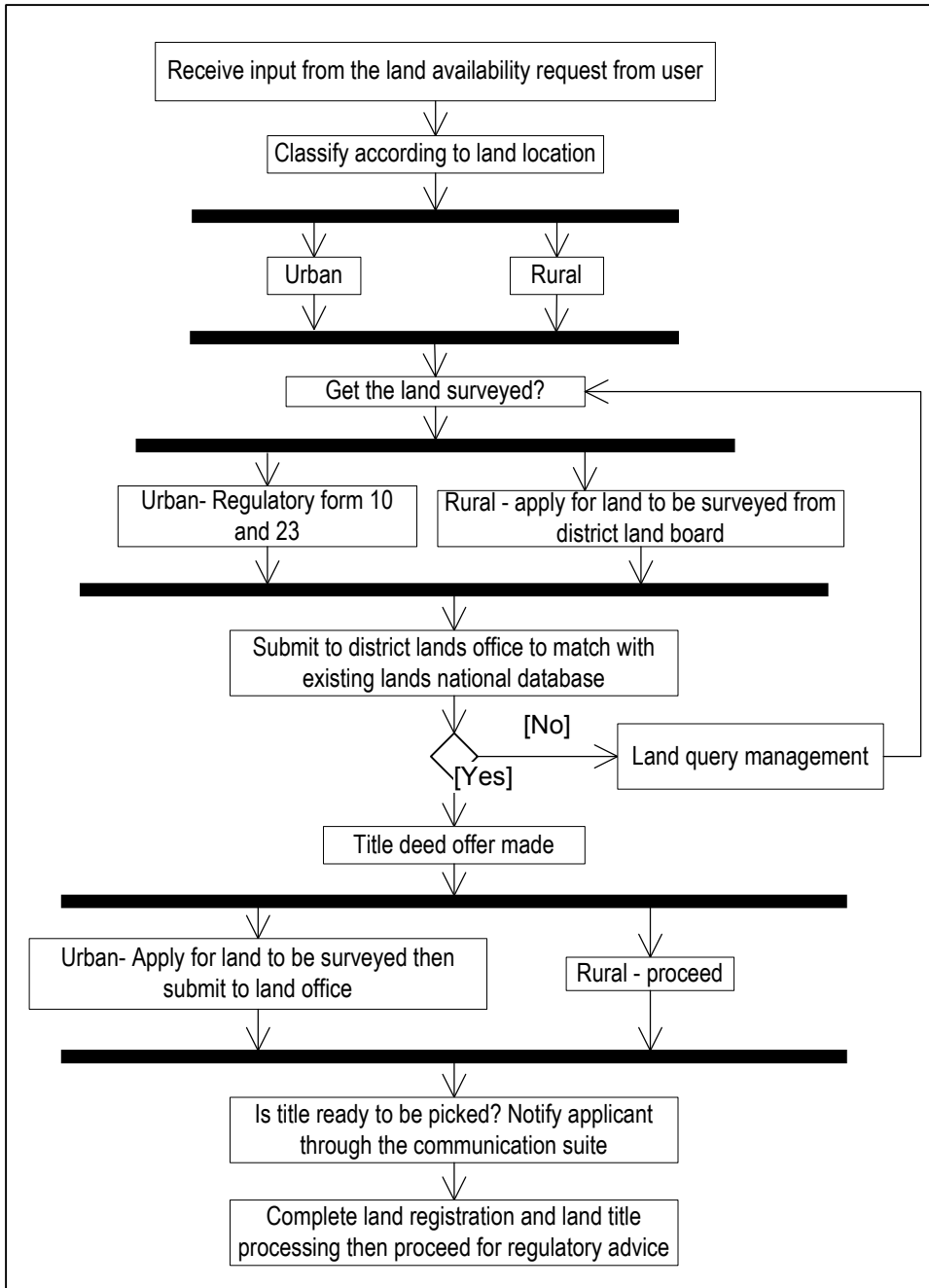


Figure 4-9: Land Registration and Title Process in the Land Acquisition Suite

Figure 4-9 represents the Land Registration and Title Process in the Land Acquisition Suite. The Land Registration and Title Process follow the Land Ownership Process. This process involves classification of the location of the land as either urban or rural. In case the land is located in the urban area, and needs to be surveyed, regulatory forms 10 and 23 are filled and submitted to the district lands office to match with the existing database. When the results show that the location is feasible the

title deed offer is made after which one applies for the land to be surveyed, then findings are submitted to the land district office after which the title is processed and ready for picking. In case the land is located in a rural area and it needs to be surveyed, one applies for the land to be surveyed from the district board after which the documents are submitted to the district land board. The applicant is then required to submit the details to the district lands office that matched it with their existing database. On clarification of the ownership of the land, a title deed offer is made after which the title is prepared and picked on notification.

Regulatory Suite

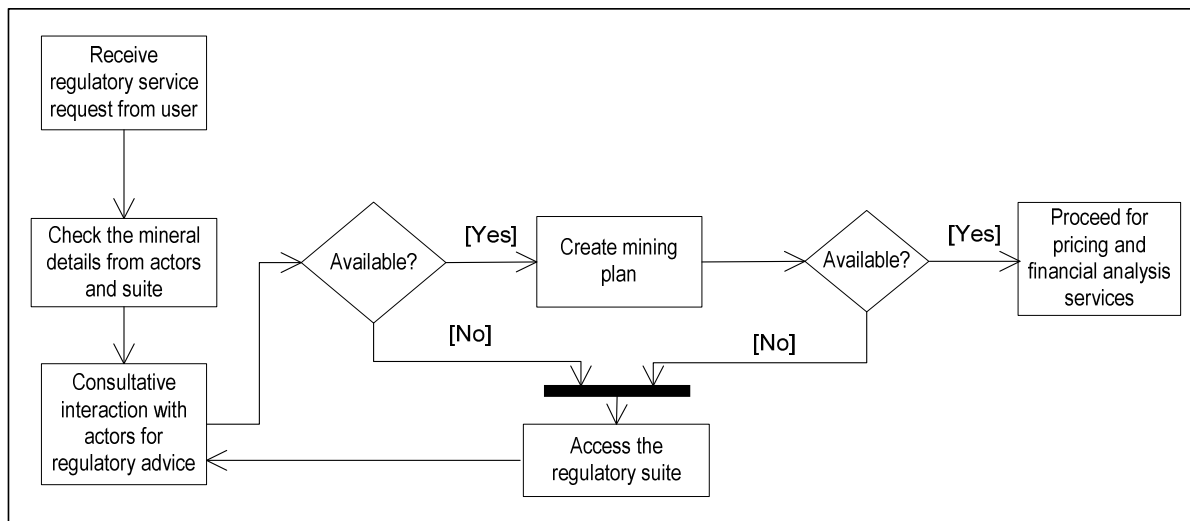


Figure 4-10: Regulatory Suite Overview

The Regulatory Suite consists of regulatory advice services which include access to regulations and mining plan creation sub-services. When a mining entrepreneur needs regulatory advice services, they proceed to identify the service. This is accompanied with actors and the use of Regulatory Suite until the entrepreneurs' regulatory decision process is completed and the actors are satisfied. The Regulatory Suite enables access to Regulatory Advice and Mining Plan Creation services as shown in the Regulatory Advice Sub-suite and Mining Plan Creation Sub-suite in Figures 4-11 and 4-12 respectively.

Regulatory Advice Services

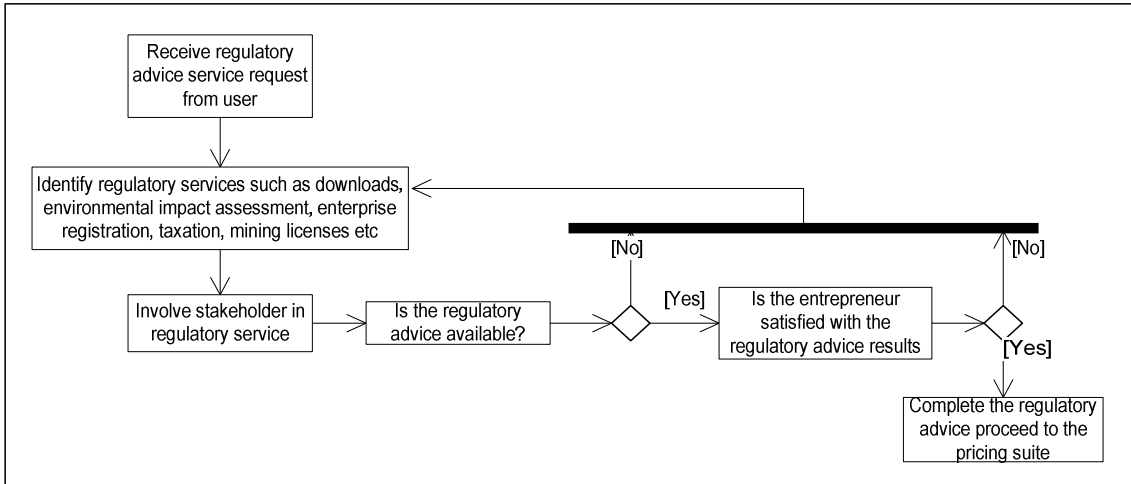


Figure 4-11: Regulatory Advice Sub-suite in the Regulatory Suite

Figure 4-11 presents the Regulatory Advice Sub-suite in the Regulatory Suite.

This sub-suite provides Regulatory Advice decision services for starting a mining enterprise. This includes identifying regulatory services such as downloads, environmental impact assessment, enterprise registration, taxation and mining licenses. The actors are involved in the regulatory advice service provision to the users and the use of regulatory suite until the entrepreneurs' regulatory advice request is completed and the actors are satisfied.

Mining Plan Creation Sub-suite in the Regulatory Suite

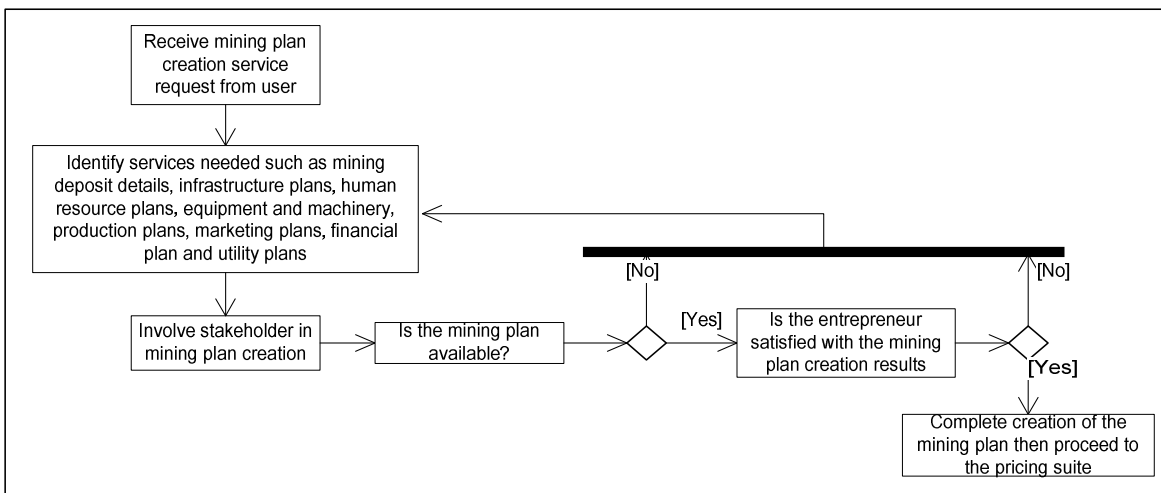


Figure 4-12: Mining Plan Creation Sub-suite in the Regulatory Suite

Figure 4-12 presents the Mining Plan Creation sub-suite in the Regulatory Suite.

In situations where a mining plan is required, the entrepreneur is provided support to interact with the actors who provide guidance in the specified items of interest namely mineral deposit details, infrastructure, human resource, equipment and machinery, production, marketing, financial and utility strategies. This is carried out until the entrepreneur is satisfied with the decision process.

Pricing Suite

The Pricing Suite provides direct linkage of suppliers to consumers and financial analysis services by providing a price estimation of products and support in Cost Benefit Analysis (CBA) and Return On Investment (ROI) projections.

Figure 4-13 presents the overview of the Pricing Suite.

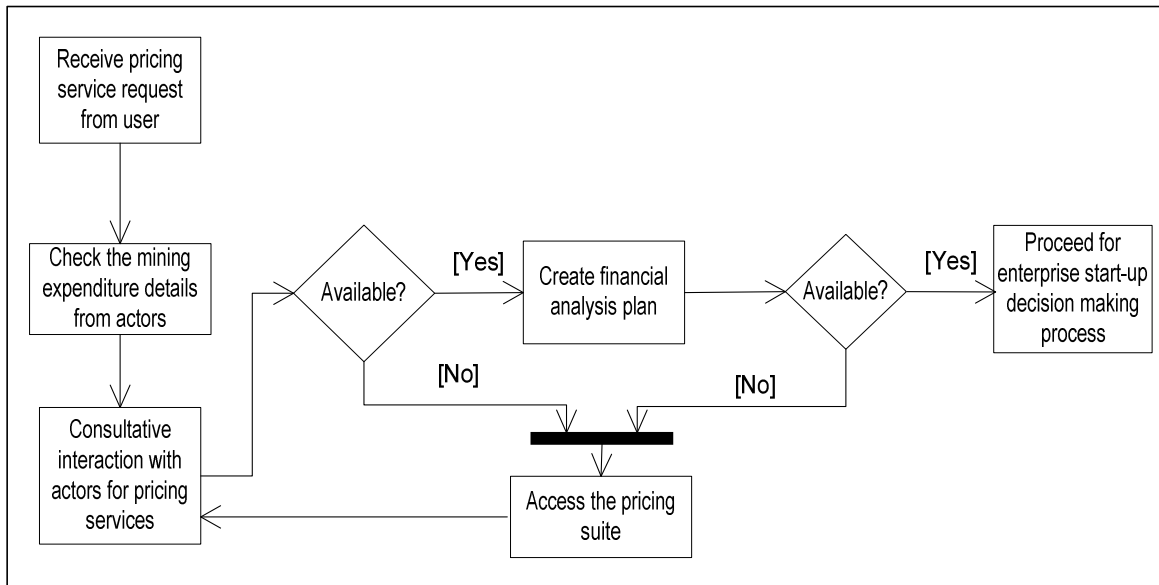


Figure 4-13: Overview of the Pricing Suite

Linking the Entrepreneur to the Customer in the Pricing Suite

The Pricing Suite consists of services that provide decision processes for enabling the mining entrepreneur link to the customers. In situations where an entrepreneur needs to get direct linkage to the customers, the entrepreneur registers the mineral details which include the product its location and contacts. The pricing service caters for the prices of the minerals from different regions. In the enterprise start-up process, there is a need to improve on the ability to identify the markets, customers and competitors (Kazooba, 2006; Baron, 2004; Erikson, 2002; Gartner et al., 1999). This is the middleman’s role that can be eliminated by providing direct linkage of the customers to the producers in

the pricing suite. This research suggests an approach to consider when carrying out direct linkage of actors using technology to improve the pricing start-up process hence eliminating the middleman.

Figure 4-14 presents process of Linking the Mining Entrepreneur to the Customer in the Pricing Suite.

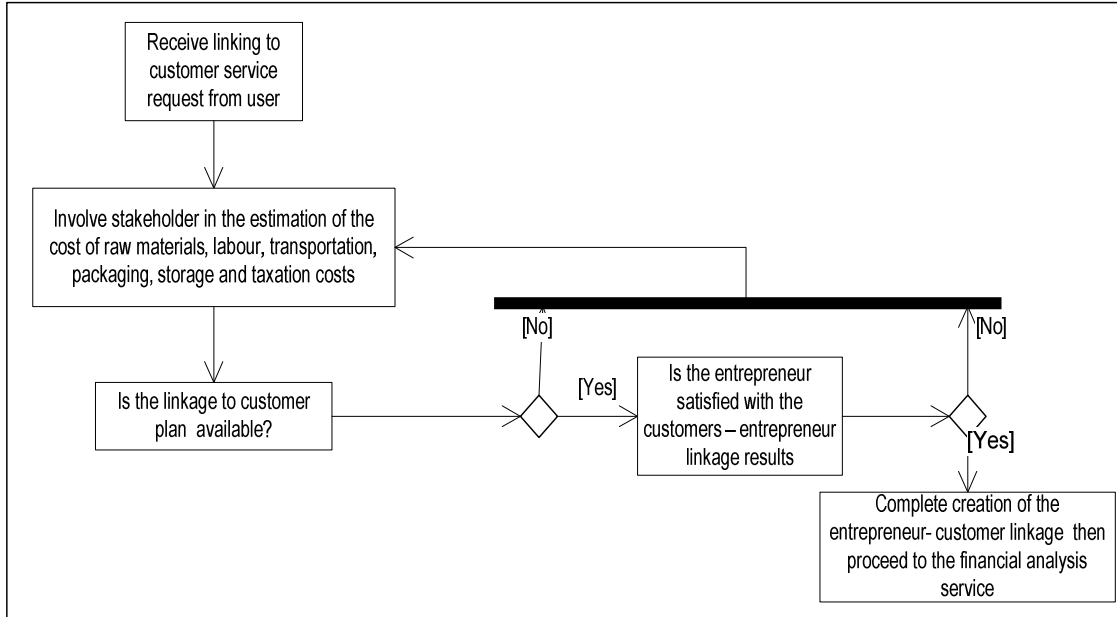


Figure 4-14: Linking the Mining Entrepreneur to the Customer in the Pricing Suite

Financial Analysis Sub-suite in the Pricing Suite

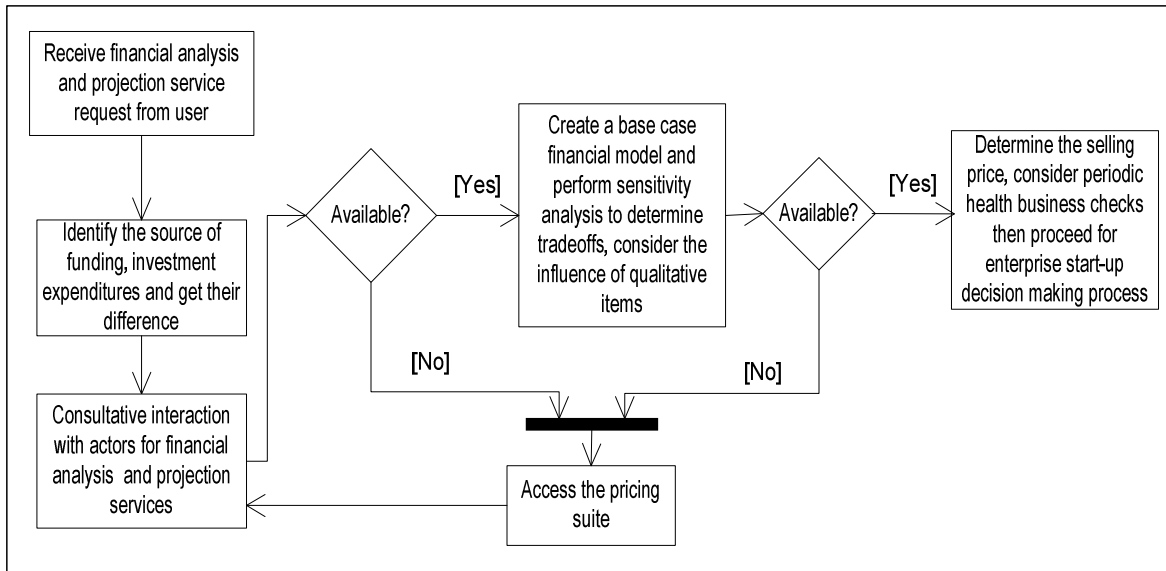


Figure 4-15: Financial Analysis Process in the Pricing Suite

Figure 4-15 presents the Financial Analysis Sub-suite in the Pricing Suite.

The Financial Analysis Sub-suite provides and projection services involved in the enterprise start-up process. Financial Analysis is important when planning to start-up a mining enterprise (Kazooba, 2010; Kunene, 2008; Erikson, 2002). Additionally, Baron (2004) argues that calculated risk taking is vital in opportunity identification, analysis and development decision process. This study suggests an interactive environment for Cost Benefit Analysis (CBA), Return on Investment (ROI) and forecast generation, explanations and coordination with the actors. This can enhance the financial analysis enterprise start-up decision process. In order for a mining entrepreneur to make an investment decision, the individual first identifies and determines the source of funding, then determines the expenditures. The difference between the investment funds and expenditures are determined and interpretations from the involvement of actors. In order for project strategies to be set, there is need for the actors to build a base case financial model, perform a sensitivity analysis by determining the tradeoffs items and consider the influence of qualitative factors. The actors then determine the selling price of product otherwise continuously make business health checks.

Communication Suite

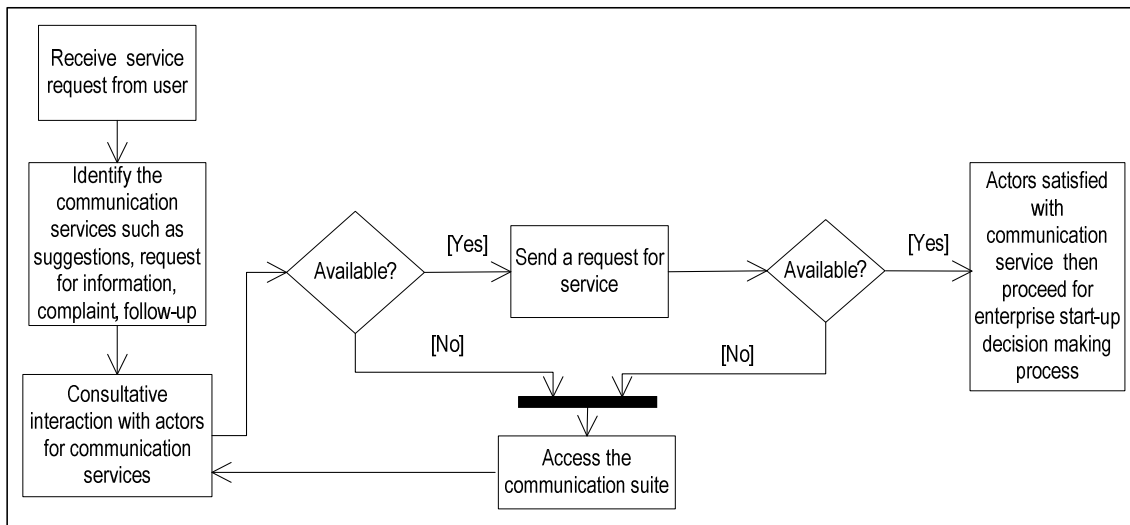


Figure 4-16: Communication Suite

The Communication Suite bridges the communication gap between the mining entrepreneurs and service providers by handling request and response services.

Figure 4-16 presents the Communication Suite containing communication services for interaction among the actors. The regional managers keep updated with the current services offered by the service providers. In addition, the regional service managers' keep in touch with the clients (start-up entrepreneurs) on the requests received and returns feedback. The regional service providers also communicate with the service providers in different organizations to post the requests to their specific attention and make sure feedback is given to the clients on the given service. The communication service involves locating a particular service offered by a service provider and return the feedback to the customer. It holds all service demands and supply's the matching statements with the existing ones offered by the service provider using a search service engine. Actor involvement is vital in the enterprise start-up process as stated by (Pavlouidakis, Galetakis, & Roumpos, 2009; Kunene, 2008; Drakopoulous & Patra, 2002). The involvement of several actors within the mining enterprise start-up process requires an easy way of communication and coordination. Progress of the available services in the studio depends on the involvement of the actors especially in understanding the process for effective participation.

In order to bridge the gap between the mining entrepreneurs and the service providers, there is need to trigger communication among the service providers by sending a request for service. It can be in the form of a suggestion, request for information, complaint and follow up. When the request is received, it is forwarded to the respective actors in charge and feedback is sent to the entrepreneur. In case the feedback is not satisfactory, the customer can send a follow-up request which is looked into until the customers request is satisfactory as shown in Figure 4-12.

CHAPTER 5. IMPLEMENTING THE UGANDA MINERS STUDIO

In this chapter we discuss the implementation of the Uganda Miners Studio (UMS). In the first section we provide the technological implementation considerations in developing the suites. We then present a description of the Uganda Miners Studio in detail and the Uganda Miners Studio verification which documents the implementation checks by various actors. Then we finally reflect on the use of the studio.

5.1 Implementation considerations

During the Uganda Miners Studio implementation, we considered the factors that interfere with and affect the application of the studio. These included technological constraints in addition to the problems described in chapter 3. The regional service centers face technological challenges of inadequate public computing assets, limited outsourced applications due to licensing problems, therefore running on inadequate computing resources. Based on these technological problems, the Uganda Miners Studio was implemented using open source and free applications to provide potential sources of enterprise start-up system components. The objective of the implementation was to show how the studio would actually operate in starting up a mining SME in Uganda.

The implementation choices involved in developing the mining enterprise start-up system include the programming languages, and network architecture.

- *Programming languages:*

The user interfaces were developed using three programming languages namely: (a) PHP Hypertext Preprocessor (PHP), (b) Hyper Text Mark-up Language (HTML), and (c) Javascript web development languages. The choice to use PHP was made because it is open source, platform independent and server-side scripting language (Xiao-Jun, 2006). Javascript is a client-side scripting language that handles service requests and submissions. For storage purposes, we used My Structured Query Language (MySQL) because it is open source and contains MyISAM tables that support speedy accessibility to start-up services (Xiao-Jun, 2006).

The Geographical Information System (GIS) map was implemented as follows. Data was extracted from the shape file with extension .shp obtained from the service providers' database. A script was used to convert the data in latitude and longitude format into JSON format. An application that reads

data from the JSON file was then developed using Asynchronous Javascript and extensible Mark-up Language (XML) (AJAX). The points were rendered in google maps using Linux Apache MySQL PHP (LAMP). AJAX is a technique used to make websites more responsive to user input, allowing portions of a page to be loaded with new information without requiring a complete reload of the page (Vandenburg, 2008). LAMP is a set of open software tools commonly used to create web applications (Ryhno & Vandenburg, 2007; Ferreira, Peng, & Flaxman, 2006; Peng & Tsou, 2003).

- *Network architecture:*

For purposes of creating a server on which to host the services, the Linux Apache server was used as the web server to handle the mining enterprise start-up services. The choice to implement services using open source Linux Apache web server was made to handle flexible, platform independent service development that allows multiple user accessibility to start-up services (Xiao-Jun, 2006). Linux is also command driven which enables access to text without loading graphics for usage in resource constrained devices. The prototype allowed the service providers to expose and register their services with the regional service managers.

The network architecture comprises of (a) server (b) business application server and (c) client sides. For the mining enterprise start-up suites to run well the following aspects need to be considered.

(a) The data server side should have at least a Pentium III with high processor speed, a colored monitor with high resolution and at least 20 Gigabytes (GB) of size in order for the prototype to run without interruptions of congestion. Additionally the server should have a Random Access Memory (RAM) of at least 1GB, MySQL server connector and Fedora Core6 Linux operating system.

(b) The business application server should have a processor of at least Pentium II or higher version, 350 Mega Byte (MB) hard disk, 128 MB RAM, MySQL connector and any operating system.

(c) The client side should have any Internet access device with high processing speed, Pentium III, a coloured screen with high resolution, hard disk of at least 1 GB, 128MB RAM, and operating system and browser independent. The client should also have any browser with no minimum specifications that can access the Internet equipped with a W3C standards compliant web. The internet link for access to the system should have at least an Ethernet (10/100MB) speed or a reliable internet connection with an average speed of 2Kbs downlinks.

5.2 Uganda Miners Studio description

This section describes and documents the Uganda Miners Studio in details. Documentation was core in the implementation of the Uganda Miners Studio since this was a learning experience that required iterative refinement of the system. Documentation tells users how to use software and what to do if software problems occur (Kendal & Kendal, 2005). System and user documentation were the types of documentation involved in this study (Hoffer, George, & Valacich, 2008). The former involves detailed information on the system's specifications, its internal workings and its functionality and the latter contains written and visual information about an application system, how it works and how to use it (Hoffer et al., 2008).

Beerel (1993) recommends the following system documentation for purposes of easy maintenance and support in coming up with other versions, technical description and a record of all computerized files. Additionally, user documentation includes a brief user guide, online and offline help and request for feedback from users (Beerel, 1993). Translated to our case, the user support included online help, offline help like Frequently Asked Questions (FAQ's) and procedural user manuals. For purposes of system documentation, source code for the Uganda Miners Studio is accessible as open source⁵.

The Uganda Miners Studio shows the suites with the mining enterprise start-up services namely Mineral Identification, Land Availability, Regulatory, Pricing and Financial analysis as described below. These are kept up dated by the department of geology survey and mines and the regional service center managers.

Figure 5-1 illustrates the Uganda Miners Studio consisting of the start-up suites.

⁵ Access to all source code is available on <http://www.ugandaminers.com>



Figure 5-1: Uganda Miners Studio

Mineral Identification Sub-suite in the Land Acquisition Suite

The Mineral Identification Sub-suite is implemented in a direct manner. The mineral coordinates are obtained from the service provider's database containing information on the locations. In order to identify minerals, the start-up entrepreneur inputs data in the service request suite or directly in the Land Acquisition Suite and Mineral Identification Sub-suite. The Land Acquisition service request is submitted to the actors who discuss and interact with the Mineral Identification Sub-suite to enhance their choices.

The Mineral Identification Sub-suite is accessible by selecting the Land Acquisition Suite on the systems menu. The Mineral Identification sub-menu contains the service necessary for identifying mineral locations using google maps. The mineral location services are provided in this sub-suite. The Land Acquisition user manual is located at the left hand side of the suite elaborating on the how to use the Mineral Identification Sub-suite. Further online user support is available using the Communication Sub-suite. The detailed query, navigation services exist in the Mineral Identification Sub-suite.

- The query services enable the users search for existing locations of specify minerals of interest. This functions by typing the desired mineral in the search box at the top of the Mineral Identification map. Alternatively, at the bottom of the map is a list of the various minerals, on clicking each item links to the exact minerals on the map.
- The navigation services enable the users to explicitly identify the exact area location of the mineral. The zoom in and out services indicated by the arrows magnify the map to allow the users identify the exact location in terms of district, local council and also identify the infrastructure in these places. Additionally, the map, satellite and hybrid map views are available to provide different display of the map. However, the map view has limited details mainly around the major towns in Uganda like Kampala and Entebbe.

The technical choices involved in implementing the Mineral Identification Sub-suite included the following. The software choices involved selection among three geographical information systems namely: (a) Arc-GIS, (b) Q-GIS, and (c) Google maps.

(a) *Arc-GIS* software was not considered due to challenges of annual licensing costs, limited accessibility, understandability, adaptability and usability. The service center managers would not sustainable handle this suite due to limited technical know-how on its operation in delivering the service to the users.

(b) *Q-GIS* software was not considered due to limited technical know-how and challenges of costs involved in uploading the software on to map-server. Other challenges included limited technical know-how on its operation in delivering the service to the users, limited understandability, adaptability and usability.

(c) *Google maps*: For purposes of mineral identification implementation, we preferred to use Google maps because it is familiar to what the users have seen and used on the Internet. There are no costs involved in maintaining and uploading information on to Google maps which is accessible over the Internet. Google maps are also platform and browser independent hence enabling its distributed accessibility to the users. In terms of space needed to run on any hardware device, its capability is less than 50 Kilobytes (Kbs) hence its accessibility on mobile phones with limited specifications. In addition, google maps have the capability to display detailed mineral location due to its “zoom in” service for in depth identification like streets, roads and other existing infrastructure.

Figure 5-2 presents the Mineral Identification Sub-suite in the Land Acquisition Suite.

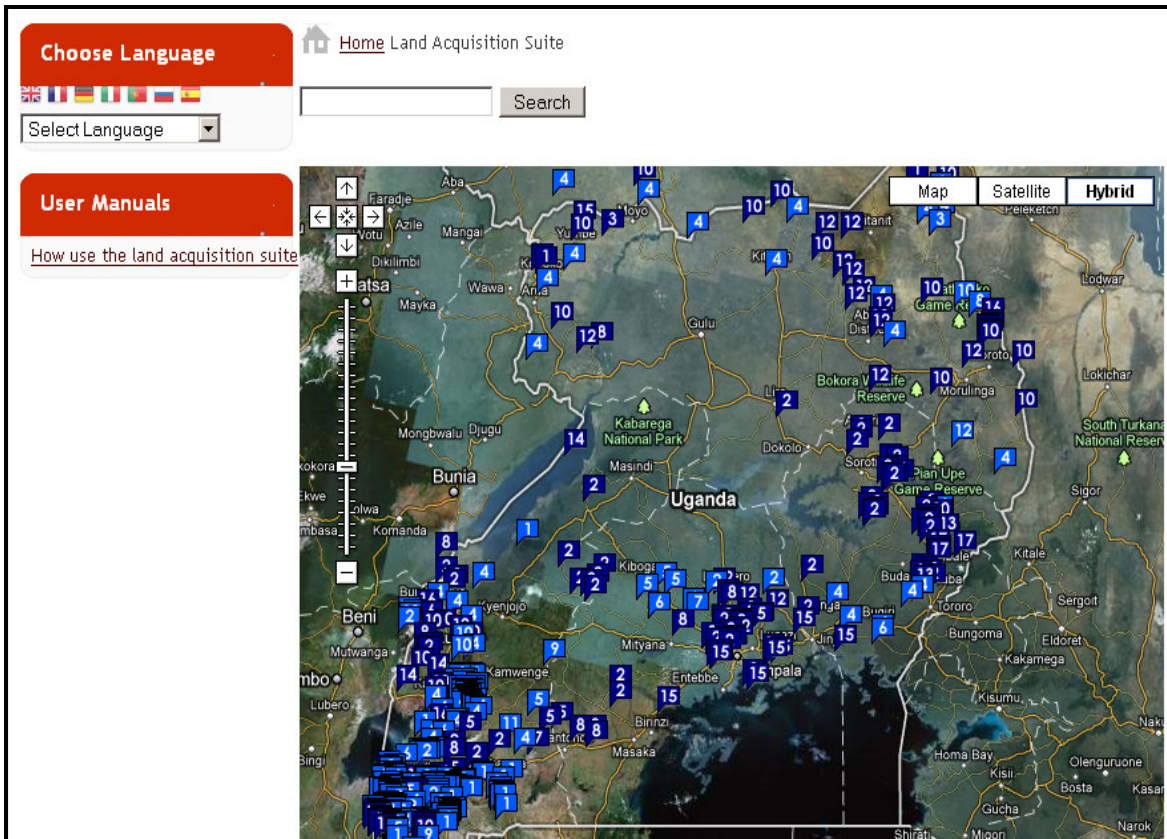


Figure 5-2: Mineral Identification Sub-suite in the Land Acquisition Suite

Land Availability Sub-suite in the Land Acquisition Suite

The Land Availability service request was implemented using information obtained from the service providers. The Land Availability Sub-suite is accessible by selecting the Land Acquisition Suite on the menu bar on the Uganda Miners Studio system menu. The Land Ownership sub-menu contains the Land Availability services. The Land Availability services are provided in the Land Availability Sub-suite. The detailed services include: addition, editing, and query land availability services.

- Enter land details service enables the users to add new service of available land for acquisition. This allows one to register the land type, land location, land size in acres and the contact person details.
- Edit land details service allows the users to make changes to an existing registered land. Detailed services such as delete and update exist to enable the users erase an entry and make changes to an existing entry respectively.

- Query services enable the users search for existing land entry of interest. This functions by entering the location of land in the search box by selecting search for land link in the land availability sub-menu.

The technical choices involved in implementing the Land Availability Sub-suite included the following. The software choices included coming up with a system that caters for the users land availability needs. There was no cost effective customizable software that would suit the users' specifications. Therefore, we preferred to implement the Land Availability Sub-suite based on the users needs for purposes of adaptability, and understandability. The Land Availability Sub-suite was implemented using PHP, Javascript and MySQL. The use of PHP and javascript enable easy integration of the web based suites. The result of the implementation is a set of Land Availability services for enterprise start-up processes.

Figure 5-3 shows the Land Availability Sub-suite in the Land Acquisition Suite.

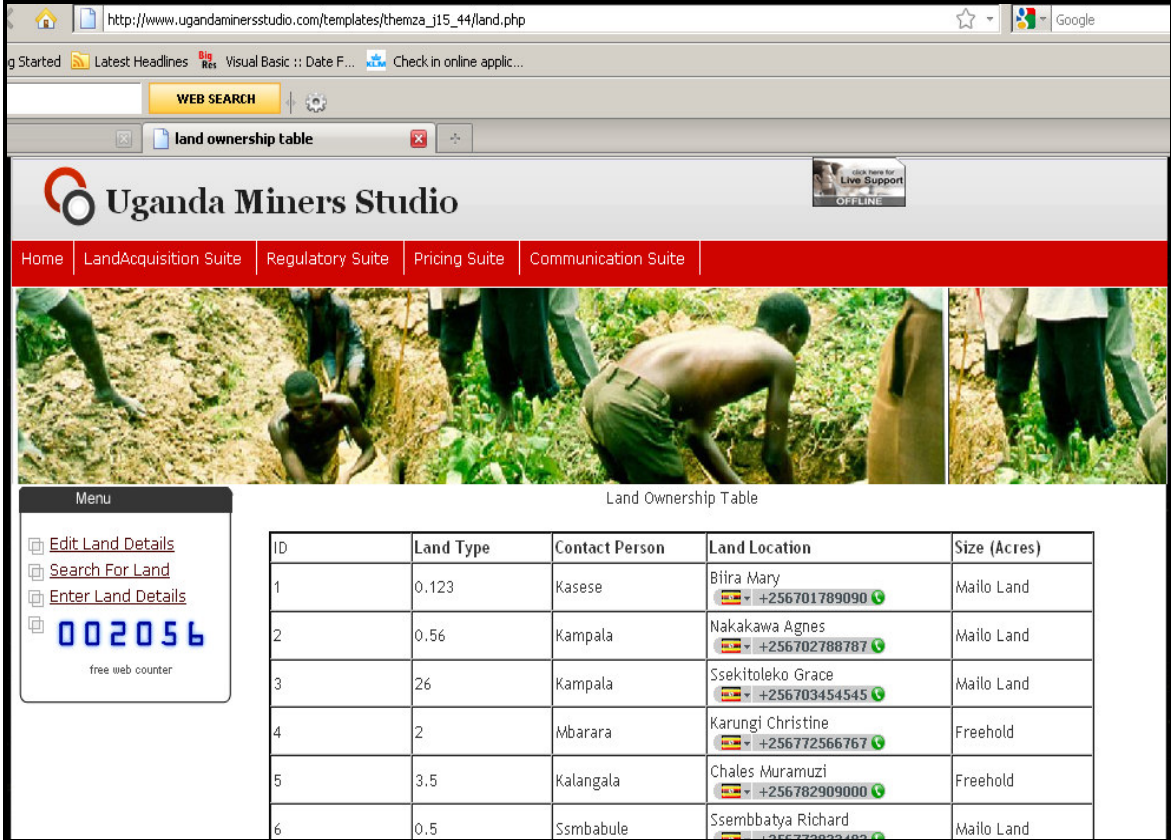


Figure 5-3: Land Availability Sub-suite in the Land Acquisition Suite

The Regulatory Suite

The Regulatory Suite is accessible by selecting the Regulatory Suite on the Uganda Miners Studio system menu bar. The Regulatory submenu's include the "know how to" and document services.

- The "know how to" services enables the users acquire information on how to use to carry out the following items: These include identifying a mineral of interest on the map of Uganda, creating a mining plan, acquire, but and register land, identify a suitable mining methods, identify types of mining licences in Uganda, locate government service standards, access mining license applications, contact various Uganda Government ministries (Website link, Names, Address). Other links in the know how to sub-suite include; direct your feedback, track the status of your response, make a follow-up submission, make an appeal submission, access funding for mining Small and Medium Enterprises, access data on community health care, Frequently Asked Questions, identify a market. The know how to sub-suite also contains the following links namely: have a mine assessed by the National Environmental Management Authority (NEMA), apply for a water connection in an urban area, locate licensing procedures for mineral exploration in Uganda, get power service installed at your premises, apply for a water extension in a rural area and how to apply for a tax payers identity number. These services are available by clicking the corresponding links to obtain relevant information needed to support the entrepreneurs know how to need in starting a mining enterprise.

- The documents service allows the users download, view and get details of various mining application related forms namely: mining act 2003, amalgamation of location license, application for a certificate of cessation suspension curtailment of working obligations, application for a goldsmiths licence, application for a location licence other than class v location licence, application for a mineral dealers licence, application for an export permit, application for approval to deal in land, application for consent to transfer of a share in an exploration retention location licence, application for conversion from, application for conversion from lands, application for registration of mining instruments, best mining methods - surface and underground mining methods, exploration retention licence return form, form 10, form 23, form of power of attorney1, form of power of attorney2, how to apply for a water extension in a rural set up, how to get power service installed at your premises, how to have a mining site assessed, licensing procedures for mineral exploration in Uganda, licensing procedures for mineral exploration in Uganda, location licence mining lease return form, memorandum of complaint, mineral dealers return form, mineral information enquires, notice of commissioners sanction of a mining lease, prospecting licence return form, surrender of exploration retention licence, surrender of location licence

or mining lease, the chief administrative officer of districts, the registration of titles act, transfer of a share in a location licence, transfer of a share in an exploration retention licence.

The technical choices involved in implementing the Land Availability Sub-suite included the software choices entailed in coming up with a system that caters for the users regulatory needs. To implement the Regulatory Suite, a customizable Content Management System (CMS) was used to handle the enterprise start-up regulatory needs.

Figure 5-4 presents the Regulatory Suite in the Uganda Miners Studio.

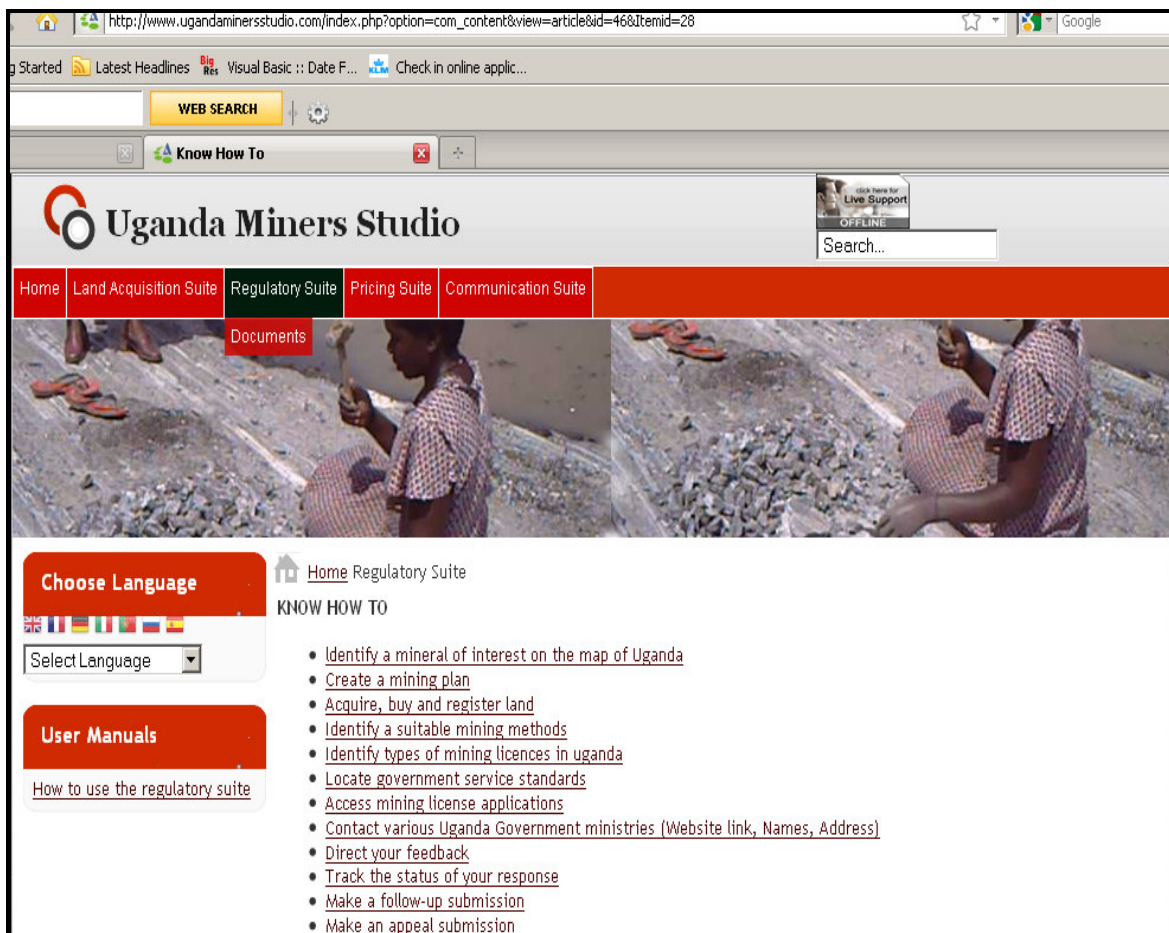


Figure 5-4: Regulatory Suite in the Uganda Miners Studio

Pricing Suite

The Pricing Suite is accessible by selecting the Pricing Suite item on the Uganda Miners Studio systems menu bar. The Pricing sub-menu contains the pricing services. The Pricing services are provided in the Pricing Sub-suite. The detailed services include: addition of mineral details, editing mineral prices, and query a mineral and graphical reports.

- Enter mineral details service enables the users to add new service of available minerals for acquisition. This allows one to enter mineral details which include mineral names, mineral types, price, regional category, quantity, location, and mineral description.
- Edit mineral prices service allows the users to make changes to an existing registered mineral. Detailed services such as delete and update exist to enable the users erase an entry and make changes to an existing entry respectively.
- Query services enable the users search for existing mineral entry of interest. This functions by entering the mineral type or mineral name of land in the search box by selecting search for mineral prices link in the Pricing Sub-menu.
- Graphical reports service provides bar graph to allow the users visualized and compare prices of various mineral according to regions. This allows the users set a price for a mineral of interest based on the representation.

The Pricing Suite user manual is located at the left hand side of the Pricing Sub-suite elaborating on the how to use the Pricing Suite.

The technical choices involved in implementing the Pricing Suite included coming up with a system that caters for the users pricing needs. There was no cost effective customizable software that would suit the users' specifications. Hence, we preferred to implement the Pricing Sub-suite based on the users needs for purposes of ease of use, adaptability, and understandability. The Pricing Suite was implemented using PHP, Javascript and MySQL.

Figure 5-5 presents the Pricing Suite consisting of view mineral item - 1, enter mineral details- 2, update mineral record - 3 and delete - 4, for additionally screen shots.

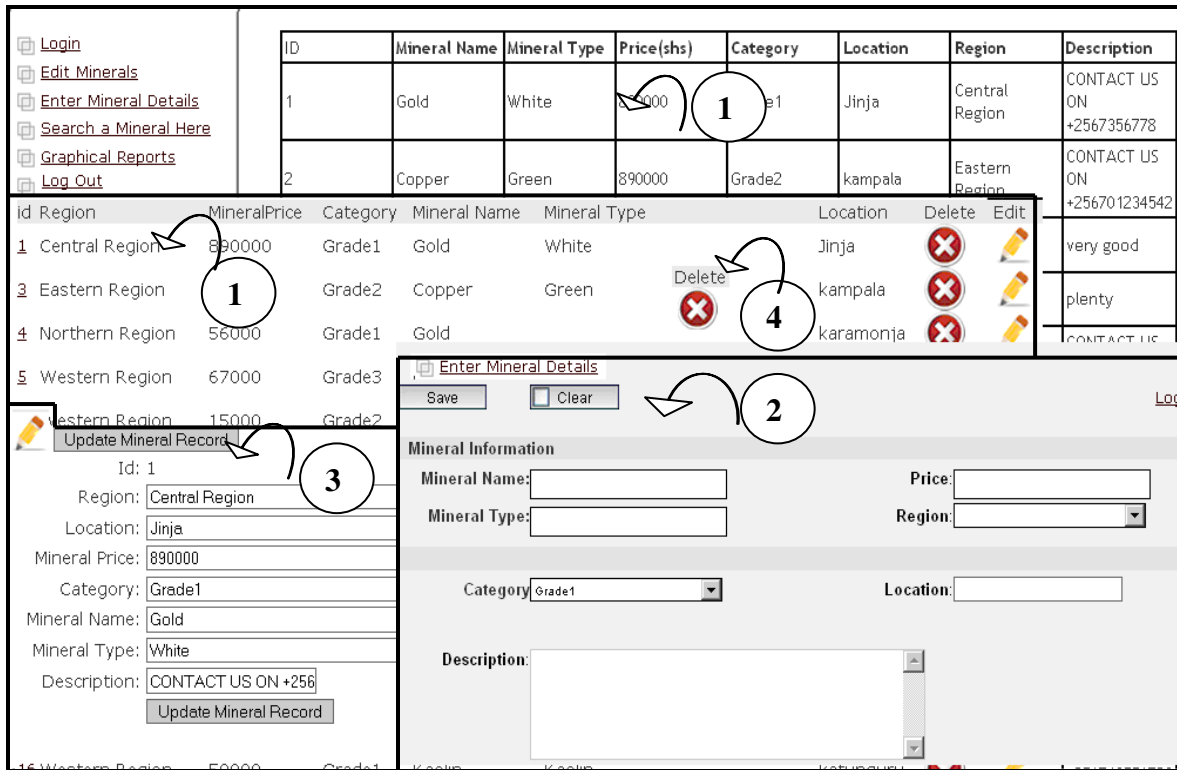


Figure 5-5: Pricing Suite in the Uganda Miners Studio

Financial Analysis Sub-suite in the Pricing Suite

The Financial Analysis Sub-suite is accessible by selecting the Financial Analysis sub-menu on the Pricing Suite menu on the Uganda Miners Studio systems menu. The Financial Analysis Sub-suite contains services such as update, reset, print, and submit on the income statement.

- The update service enables the users make changes to the existing income statement details.
- Reset service allows the users erase the entered details in the statement, to allow one enter different details.
- Print services enable the users to send the document for printing to the attached existing printer.
- The submit service allows the users send a copy of the income statement as an attachment by e-mail.

The technical choices involved in implementing the Financial Analysis Sub-suite included the software choices entailed in coming up with a system that caters for the users financial needs. To implement the Financial Analysis Sub-suite, a customizable Financial Analysis Sub-suite was used to comply with the users' needs. The spreadsheets Financial Analysis Sub-suite was preferred to implement the financial

analysis based users' needs for purposes of ease of use, adaptability, and understandability. The Financial Analysis Sub-suite was implemented using PHP, Javascript and MySQL.

Figure 5-6 presents the Financial Analysis Sub-suite in the Pricing Suite.

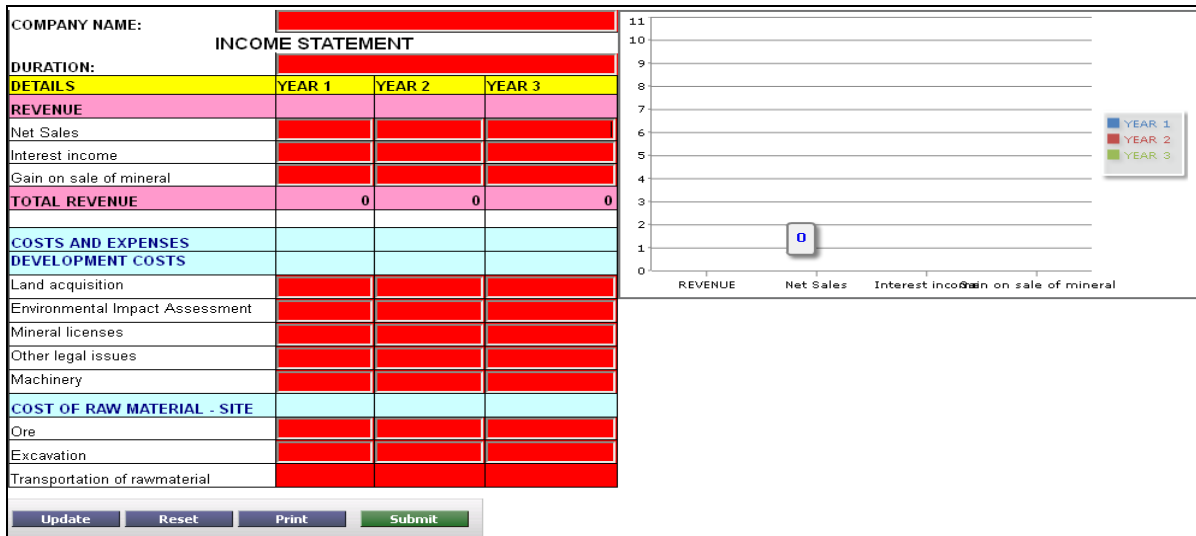


Figure 5-6: Financial Analysis Sub-suite in the Pricing Suite

The Communication Suite

The Communication Suite is accessible by selecting the Communication Suite item on the Uganda Miners Studio systems menu. This Communication Suite contains various communication services such as submit, track, follow-up, appeal, survey and contact us details. The communication user manual provides details of how to use the Communication Suite.

- Submit service enables the users to send a request to the service providers. The users enter email address details, select the type of feedback such as complaint, compliment, suggest or request for information. The feedback subject area enables the users enter feedback subject and details, then one selects the institution to which the comment is to be directed. The user records the tracking number of the feedback, after which the details are sent to the service provider.
- Tracking services allow the user get feedback from the service providers on the sent request. This is available by entering the tracking number in the search field.
- Follow-up services enable the users enter follow-up details such as the tracking reference number, and the details. These details are forwarded to the service provider who is prompted to respond to the service request.

- Appeal services enable the users get inquiry services of how to make an appeal. This service caters for users that received a response but are unsatisfied with it the feedback. To enable an objective review of the users' request, all appeals submission are sent to the attention of the service provider who was not part of the initial response/decision.
- Survey service allows the users provide feedback on the usability of the software for purposes of improvements in the next version. Such details include layout, visual appearance, language, instructions, and any other feedback on the system to the service provider.
- Contact-us service enables the users get service provider address details such as the Ministry of Defense, Ministry of Local Government, Ministry of Health (MoH), Uganda Investment Authority, National Forestry Authority, National Water and Sewage Corporation (NWSC), Ministry of Water and Environment, Ministry of Gender, Labour and Social Development (MoGLSD), Uganda National Bureau of Standards (UNBS), Department of Geology Survey and Mines, Ministry of Lands, Housing and Urban Development, National Environmental Management Authority, Uganda Revenue Authority. This service allows the users know the premises, and get details of the various submission offices and contacts for purposes of follow-up and inquiry in the start-up decision process.

Figure 5-7 presents the Communication Suite in the Uganda Miners Studio that enables the users to input requests and receive responses.

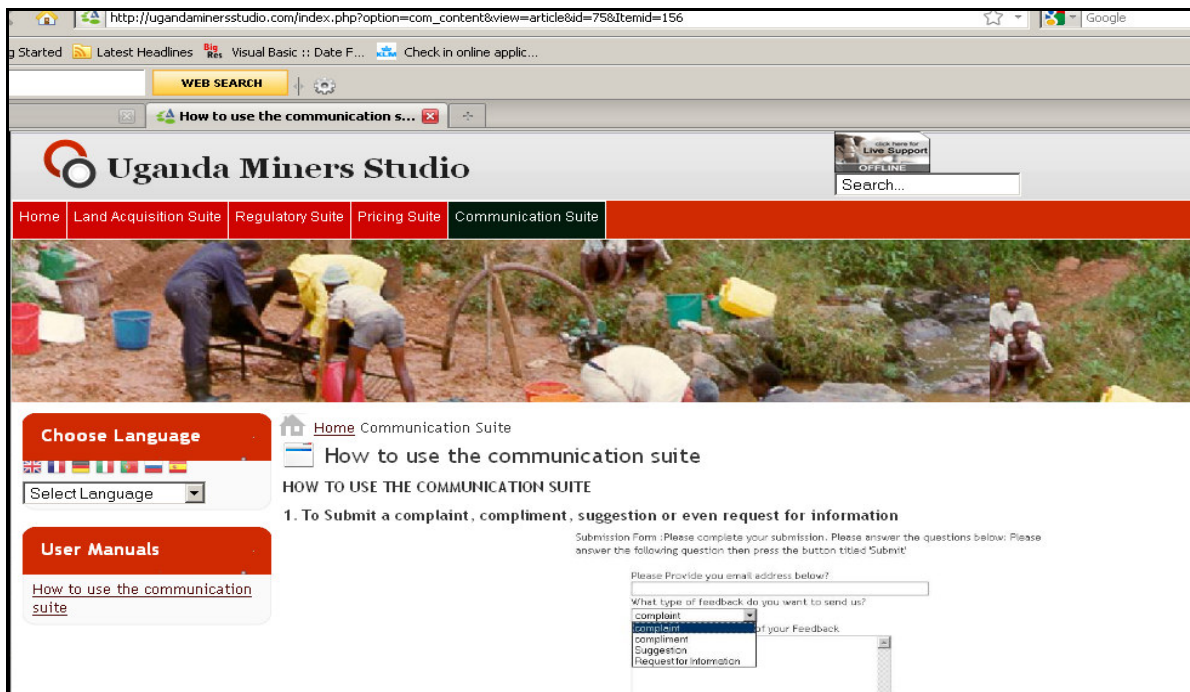


Figure 5-7: Communication Suite in the Uganda Miners Studio

Figure 5-8 presents the Contacts Sub-suite in the Communication Suite.

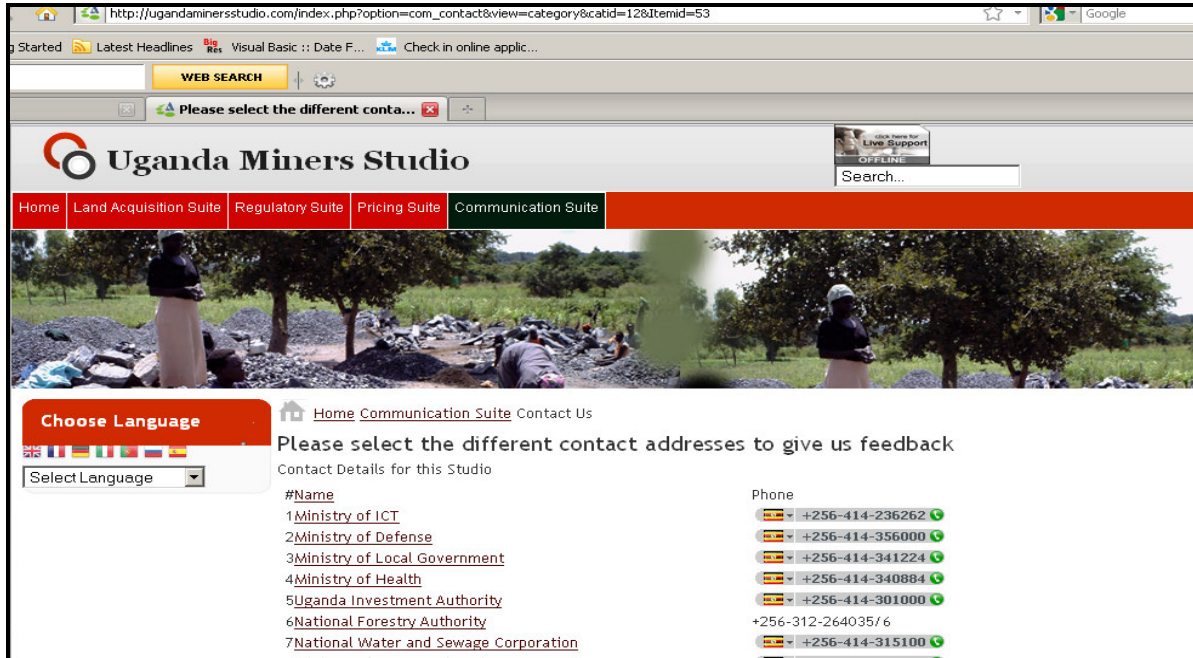


Figure 5-8: Contact Sub-suite in the Communication Suite

Uganda Miners Studio Verification

The verification of the content in the enterprise start-up process involved having sessions with the fifteen experts from DGSM, eight colleagues from the Department of Business and ICT at the Rijksuniversiteit Groningen (RUG), twenty five students in the Bachelor of Computer Science class at Mbarara University of Science and Technology (MUST). The DGSM experts that participated in the verification sessions comprised of the ten mining entrepreneurs and five DGSM officials. The Uganda Miners Studio verification checks were carried out to avoid propagation of errors. All user feedback was recorded in the verification sessions.

The participants were provided with short explanations of the study, its objectives, its findings and the studio a few weeks before the verification sessions. Prior to that, we communicated to participants on telephone to place appointments for the suitable time for the verification sessions. We used two sessions for the verification purposes which lasted for three to four hours each. Comments were recorded in sessions by the researcher and a volunteer.

Table 5-1 presents the verification check for errors in the Uganda Miners Studio carried out with the participants.

Table 5-1: Verification procedure for the Uganda Miners Studio by participants

Component and activity	Verification procedure
<p>Home Page Establishing the integrated tool that links various suites.</p>	<ul style="list-style-type: none"> • Check if the enterprise start-up system is running. • Check if the menu items are working. • Check if the search component is running. • Check if the language tool is running (choose language – left of system).
<p>Land Acquisition Suite Creation of the land acquisition start-up process. Producing mineral distribution reports, creation of land availability details of identified mineral locations.</p>	<ul style="list-style-type: none"> • Check if the land acquisition suite user manual is working. • Check if the land acquisition search item is running and return feedback on what is searched. • Check if the land acquisition map navigation tool is running (zoom, in, zoom out). • Check if the land acquisition map tabs are running (map, satellite and hybrid). • Check if the land acquisition shortcut mineral key links are running. • Check if the land availability suite and user manual is running. • Check if the “enter land details” item is running. • Check if the search for land item is running. • Check if the “edit land details” item is running. • Check if the reports are being produced accurately.
<p>Regulatory Suite Creation of regulatory reports, downloading and uploading regulatory documents.</p>	<ul style="list-style-type: none"> • Check if the regulatory suite user manual is working. • Check if the regulatory “know how to” links are running. • Checking if the regulatory downloads item is running. • Checking if the regulatory documents are being uploaded to the server. • Check if the reports are being produced accurately. • Check if the regulatory mining plan creation link is running.
<p>Pricing Suite Creation of the linking between the customers and the mining entrepreneurs. Creating reports on mineral prices and their quantities. Creating financial documents for analysis.</p>	<ul style="list-style-type: none"> • Check if the pricing suites user manual is running. • Check if one can enter mineral details, • Check if the edit mineral detail is running. • Check if the search for mineral prices is running. • Check if the view graph of the mineral distribution is running. • Check if the delete mineral is running. • Check if the update mineral record is running. • Check if the reports are being produced accurately. • Check if the financial analysis tools are running (income statement, balance sheet and profit and loss) is running. • Check if the financial analysis graph is running.
<p>Communication suite Creation of the communication process, producing TRNs, tracking and getting responses, creating a system for complete communication responses.</p>	<ul style="list-style-type: none"> • Check if communication user manual is working. • Check if the communication services like (submit, track, follow up, appeal, survey) are running and able to allow users submit requests, and receive responses. • Check whether the users can track the response from the submitted request using the tracking item, then request for a follow- up in case the request is not granted or delayed feedback. • Check if the chatting item is running and able to allow the users log in and log out. • Check if the communication cycle. • Check if the reports are being produced accurately.
<p>General</p>	<ul style="list-style-type: none"> • Check if the security level are set and working properly in the communication and regulatory suites. • Check whether the systems can be accessed from different computers and devices with different operating systems and browsers of different versions for consistency. • On deployment of the system check for the reliability and availability of the system. • Check the navigation of the system. • Check the speed of the system.

This chapter described the implementation of support to starting mining entrepreneurs using the Uganda Miners Studio. Using the suites, it is possible to facilitate start-up decisions such as identification of the exact mineral locations, acquire land, attain the necessary regulatory advice, locate mineral customers, and improve financial investment decisions. These enable the decision makers' estimate proactively the mining enterprise start-up solution capacity. Therefore the participants get insight into the possible start-up procedures in the context of mining enterprises. The Uganda Miners Studio is tested as described in Chapter 6.

CHAPTER 6. TESTING THE STUDIO

In this chapter we describe the evaluation procedures carried out on the mining enterprise start-up studio in Uganda. The studio results from the design described in chapter 4 consisting of the start-up services and the Uganda Miners Studio implemented in chapter 5 to support the mining enterprise start-up decision process. We describe the evaluation approach followed by the evaluation of the studio. The resulting information allowed us to determine the adequacy of the studio in facilitating the decisions in starting a mining enterprise in Uganda.

6.1 Evaluation approach

This chapter describes the testing that was carried out on the studio in its application to mining enterprise start-ups in Uganda. Keen & Sol (2008), indicate that usefulness, usability and usage are key aspects of decision enhancement. The *usefulness* aspect addresses the value that the studio adds to the enterprise start-up decision process (Keen & Sol, 2008). The *usability* aspect looks at the extent to which the studio is perceived usable by the users which includes the ease of interaction (Keen & Sol, 2008). The *usage* aspect relates to the actual application of the studio in the mining enterprise start-up process (Keen & Sol, 2008). Usage in this study was looked at as the application of the studio in supporting the enterprise start-up process from the participants' satisfaction perspective (Endsley, 1988). Additionally, Davis (1989) also defined usefulness as the degree to which a person believes that using a particular system enhances the enterprise start-up process and usability as the degree to which the entrepreneur's mental effort easily learns the studio. Usefulness is how suitable a system is in achieving a certain goal (Wang, 2007; Muniafu, 2007). This research considered the understandability of the key startup issues, relevance of the actual issues, the added value, addressing the issues expected and the correct representation of the context. For purposes of this research, we interpreted the 3 U's as follows:

- Usefulness is the value that the studio adds to the enterprise start-up decision process.
- Usability is the extent to which the studio is usable by the users which includes the ease of interaction.
- Usage is the actual application of the studio in supporting the enterprise start-up process from the participants' perspective.

The researcher used the following testing theories in the evaluation process namely; situation awareness rating technique (Davis, 1989); and basic usability engineering lifecycle (Nielsen, 1994). According to Nielsen (1994), usability addresses four perspectives namely; learnability, efficiency of use, memorability, few errors and satisfaction. In the evaluation process, the researcher considered the following usability aspects: simplicity of language, less ambiguous words, absence of complex words, preference, ease of use, and absence of confusion when using the studio.

Regional service centers and participants

Testing was carried out in the regional DGSM regional service centers in Uganda, namely: Central (Masaka and Kampala), Eastern (Tororo and Jinja), and Western (Kasese, Kabarole, Kabale, and Mbarara) districts. The researcher involved experts in the mining field at three levels: government representatives from DGSM, mining consultants and the mining entrepreneurs. One hundred and two participants were selected for evaluation based on the sampling theory (Norusis, 2010; Spiegel & Stephens, 2008). Table 6-1 shows the experts that participated in the testing sessions.

Table 6-1: Summary of stakeholders that participated in the studio evaluation

Region	Experts	Numbers (N)
Central	Mining entrepreneurs (33), Mining consultants (5), Government – DGSM (5)	43
Western	Mining entrepreneurs (34), Mining consultants (10), Government – DGSM (4)	48
Eastern	Mining entrepreneurs (7), Mining consultants (2), Government – DGSM (2)	11
Total	102	102

Evaluation procedure

The researcher organized for testing sessions after which questionnaires and interviews were conducted. The researcher sought to use interviews to get clarification to the responses. In the testing sessions, the researcher took time to recap what the research was about, the definition of enterprise start-up, the studio and the reason for evaluation. In order to check the studio design, the researcher began with a discussion on the studio design and its components. This was followed by questions relating to the design that had been discussed in order to get an opinion about the research results from the participants.

The evaluation questionnaire comprised of two sections (see Appendix 3). The first section was intended to evaluate the usefulness, usability and usage of the studio. This section contained questions obtained from previous work (Yonazi, 2010; Muniafu, 2007; Wang, 2007). The second section contained an open-ended question intended to capture any information that respondents wanted to communicate to supplement the closed-ended part. The questions were formulated as statements that aimed at focusing the respondents to explicitly express their opinion. The closed ended section was arranged in a five point likert scale to measure the respondents' perceived attitude to a given statement. The five point scale ranged from strongly disagree (1), disagree (2), neutral (3), agree (4), to strongly agree (5). Likert scales fall into the ordinal data category (Brown & Saunders, 2008; Jamieson, 2004). Non-parametric tests are appropriate for ordinal data analysis (Brown & Saunders, 2008).

Structure of the testing sessions

The users that participated in the testing sessions comprised of the mining entrepreneurs and experts that participated in the exploratory study. The users were formally invited to participate in the testing sessions. The participants were provided with short explanations of the study, its objectives, its findings and the studio two weeks before the testing session. Prior to that, the researcher communicated to them on telephone to place appointments for the suitable time for the testing sessions. A total of four sessions at each regional service center was held during the evaluation period running from December 2010 to March 2011. Each session lasted for about three to six hours daily for three to five working days at each of the regional service centers. The researcher took notes during each of the sessions.

In the first session, a short introduction of the research was presented. The users reflected on the research and the choices made for using decision enhancement services in a studio to improve the mining enterprise start-up process. Additionally, the researcher carried out a walk through the studio with a presentation of the tool. The second session involved carrying out a studio walk through followed by the introduction and navigation user manuals for each of the enterprise start-up suites. This involved interludes of discussions and reflection of the aim of each start-up issue and its solution. The third session involved using the studio in addressing the start-up scenarios. Finally the four session entailed discussions on the studio followed by the questionnaires. Uniformity of each regional service center testing session was ensured by a fixed agenda as indicated.

Session 1: Aim – Getting acquainted to the research study.

- a) Introduction and background to the research.
- b) Problem statement and the requirements.
- c) Decision enhancement as the solution to enterprise start-up service development – studio design.
- d) Studio walkthrough with a presentation.

Session 2: Aim – To get mining managers acquainted with the start-up process and tool as well as create understanding the platform in achieving its objectives mentioned. This session tested the usability and usage of the studio.

- a) Studio walkthrough.
- b) Introduction of the tool.
- c) Introduction of the user navigation manual.
 - Follow step one of the start-up process: Mineral identification.
 - Then use the land acquisition suite.
 - Users select a mineral of their choice then search for its location and near mineral details.
 - Land ownership procedures.
 - Use the land ownership sub-component in the land acquisition suite.
 - Users interact with the tools for some minutes.
 - Stir brief discussion - sharing insights with colleagues and researcher: A break of 5 minutes.
- d) The Regulatory Suite
 - Look at the procedures.
 - Support from the tool.
 - Discussion- sharing insights with colleagues. A break of 5 minutes.
- e) The Pricing Suite
 - Follow through the procedures.
 - Support from the tool.
 - Discussion - sharing insights with colleagues. A break of 5 minutes.
- f) The Communication Suite
 - Follow through the procedures.
 - Support from the tool.
 - Discussion - sharing insights with colleagues.
- g) Get feedback then end of session one.

Session 3: Aim - This session tests the usefulness and usage of the tool in mining enterprise start-up. Useful is defined as the degree to which a person believes that using a particular system would enhance his or her job performance of enterprise start-up. The aim of this session was to enable managers communicate their insights to fellow managers on the usefulness of the tool in enterprise start-up.

- a) Users open the tool - Land Acquisition Suite
 - Users are guided through start-up activities like land acquisition and land ownership activities based on an actual case and follow all the way through.
 - Users make observations at each of the phases and take note of the output.
 - Users select variables they want to test with based on interest.
 - Users run through the land acquisition and land ownership activities.
 - Users observe the out puts.
- b) Users open the tool - Regulatory Suite
 - Users are guided through regulatory activities based on an actual case
 - Users make observations at each of the phases and take note of the output
 - Users select variables they want to test with based on interest
 - Users run through the regulatory activities

- Users observe the out puts
- Users now share the insights gained with their fellow users and the researcher.
- c) Users open the tool - Pricing Suite
 - Users are guided through pricing activities based on an actual case.
 - Users make observations at each of the phases and take note of the output.
 - Users select variables they want to test with based on interest.
 - Users run through the pricing activities.
 - Users observe the out puts.
 - Users now share the insights gained with their fellow users and the researcher.
- d) Users open the tool – Communication Suite
 - Users are guided through communication activities based on an actual case.
 - Users make observations at each of the phases and take note of the output.
 - Users select variables they want to test with based on interest.
 - Users run through the communication activities.
 - Users observe the out puts.
 - Users now share the insights gained with their fellow users and the researcher.
- e) Discussions then get feedback.
- f) End session.

Session 4: Aim - To inquire from the respondents the relevance of using the start-up steps with the suites in addressing each of the start-up problems.

- (a) Discussions then get feedback.
- (b) End of session.

6.2 Evaluation of the Studio

This section presents the results based on usefulness, usability and usage of the studio. The results presented were classified according to mean (\bar{x}), standard deviation (σ), and mode (m) as recommended by (Jamieson, 2004). The mode indicates the attitude of the subjects concerning the quality of the proposed studio. The results are arranged according to the three regions; central, western and eastern. Reliability testing was carried out to determine the consistency and regularity of the responses to the questions in the questionnaire. *Reliability* is the “reproducibility of a measurement” (Norusis, 2010). Reliability was examined using the Cronbach’s alpha values (α) (Howitt & Cramer, 2005). The responses were above 0.7 which indicated good reliability as shown in all the tables. In order to draw insights and conclusions from the study, the researcher carried critically analysed the results in the tables provided.

Table 6-2 presents the results with regard to the Usefulness of the Studio.

Table 6-2: Evaluation of the Usefulness of the Studio

Usefulness questions	Cronbach's Alpha	Western N=48			Central N=43			Eastern N=11		
	α	\bar{x}	σ	m	\bar{x}	σ	m	\bar{x}	σ	m
1. Using the suites helped me better understand the general start-up processes targeted in this project.	0.782	3.50	1.130	4	3.74	1.274	5	4.45	.522	4
2. Using the suites assisted me understand the activities involved in starting a mining enterprise.	0.782	3.46	1.051	3	3.44	1.007	3	4.45	.688	5
3. The studio is not useful in improving the start-up process.	0.705	1.23	.425	1	1.23	.427	1	1.36	.505	1
4. Is there anything that you expected from the guidelines that was not included?	0.742	1.21	.410	1	1.21	.412	1	1.55	.522	2
5. I think that the mining enterprise start-up process among the stakeholders cannot be improved with the studio.	0.742	1.21	.410	1	1.21	.412	1	1.55	.522	2
6. Using the suites did not improve the quality of my work.	0.742	1.27	.449	1	1.19	.394	1	1.55	.522	2
7. The studio did not improve my understanding of the key issues in starting a mining enterprise.	0.742	1.46	.504	1	1.28	.454	1	1.55	.522	2
8. Using the studio helped me accomplish my work better and faster than otherwise.	0.710	4.50	.583	5	4.63	.489	5	4.36	.674	4
9. The suites reflect the actual issues that are involved in starting a mining enterprise.	0.710	4.48	.583	5	4.65	.573	5	4.55	.522	5
10. Using the suites facilitated my access to mining start-up issues.	0.710	4.35	.729	5	4.58	.499	5	4.64	.505	5
11. There is added value in using the studio (suites and guidelines).	0.710	4.35	.729	5	4.58	.499	5	4.64	.505	5
12. I would not prefer to carry out my mining enterprise start-up without the studio.	0.710	4.44	.616	5	4.60	.495	5	4.55	.522	5
13. The suites do not really address the issues I expected.	0.878	1.31	.468	1	1.49	.631	4	1.64	.505	2

Usefulness (questions 1 – 13)

The answers presented in table 6-2 indicate that most participants valued the mining enterprise start-up studio, as it helped them gain insights into the start-up processes targeted in this case mode 4. This was especially so for issues regarding stakeholders involvement, their activities and the information flow among them (question 1 and 2). The participants agreed and were satisfied with the guidelines importance in improving the start-up process (question 3, 4, 5 and 11 with mode 1 for negative statements and question 11 mode 5). Most participants agreed that the suites improved the quality of their work and enhanced their understanding of the mining enterprise start-up issues (question 6 and 7 with mode 1). Using the studio helped the respondents accomplish the start-up process better and faster and the suites reflected the actual issues involved in starting a mining enterprise in this case mode 5 for questions 8 and 9 and mode 1 for questions 13. The participants preferred to carry out the mining enterprise start-up activities with the help of the suites and stakeholder involvement as the

services were accessible and addressed the start-up issues in this case mode 5 and 1 for questions 12 and 13 respectively.

Table 6-3 presents the evaluation results of Usability of the Studio. The feedback was arranged according to regions and classified in columns of mean (\bar{x}), standard deviation (σ) and mode (m).

Table 6-3 Evaluation of the Usability of the Studio

Usability questions	Cronbach's Alpha	Western N=48			Central N=43			Eastern N=11		
	α	\bar{x}	σ	m	\bar{x}	σ	m	\bar{x}	σ	m
14. The suites used simple language that is easily understandable.	0.714	3.85	.772	4	4.26	.790	5	4.09	.831	4
15. The suites did not contain ambiguous words that make it complex to understand.	0.714	3.67	.781	4	4.05	.815	5	4.09	.831	4
16. The suites catered for definition of complex words.	0.714	3.67	.859	3	4.00	.816	5	4.00	.775	4
17. Overall it was easy to understand the suites.	0.703	4.15	.850	5	4.58	.626	5	4.45	.688	5
18. I can communicate the suites and guidelines to other people.	0.703	4.17	.834	5	4.58	.626	5	4.45	.688	5
19. I would prefer working with the studio (suites and steps).	0.703	4.02	.812	4	4.33	.715	1	3.73	.647	4
20. I did not always seek clarification when using the suites.	0.717	4.29	.771	5	4.30	.708	5	4.64	.505	5
21. I was not often confused when using the suites.	0.717	4.35	.729	5	4.40	.660	3	4.64	.505	5
22. I did not need professional support in using the suites.	0.717	4.29	.771	5	4.30	.708	1	4.64	.505	5
23. The language used to present the suites and steps was not understandable	0.717	1.31	.468	1	1.49	.631	1	1.64	.505	2

Usability (questions 14 - 23)

The answers presented in table 6-3 show a positive feedback. The studio used simple language that was understandable and did not contain ambiguous words with mode 4 (questions 14 and 15). However, the suites did not cater for definition of some complex words as shown in question 16. The respondents felt that the suites need an added component for words like studio and suites to facilitate easy understanding by other mining entrepreneurs. Overall, the participants found the suites easy to understand as they could communicate the studio to other people, in this case mode 5 for both questions 17 and 18. Additionally, the respondents preferred working with the studio mode 4 in question 19. The participants did not always seek clarification, professional support and were not confused when using the studio as the language presented was understandable with modes 5 for questions 20, 21, and 22 then modes 1 for question 23.

Table 6-4 presents the evaluation results of Usage of the Studio. The feedback was arranged according to regions and classified in columns of mean (\bar{x}), standard deviation (σ) and mode (m).

Table 6-4 Evaluation of the Usage of the Studio

Usage questions	Cronbach's Alpha	Western N=48			Central N=43			Eastern N=11		
		x	σ	m	x	σ	m	x	σ	m
24. In your view, can the studio be accepted in a real start-up project?	0.817	4.31	.512	4	4.44	.502	4	4.27	.467	4
25. I am optimistic of using the guidelines when starting a mining SME.	0.817	4.23	.692	4	4.44	.548	4	4.45	.522	4
26. Usage of the studio features and suites did not correctly represent the relevant context of mining in Uganda.	0.878	1.31	.468	1	1.21	.412	4	1.64	.505	2
27. I will not use the suites when starting a mining enterprise.	0.878	1.31	.468	1	1.49	.631	5	1.64	.505	2
28. The usage of the guidelines are too high level and hard to be implemented.	0.705	1.50	.505	1	1.33	.474	1	1.45	.522	1
29. The guidelines are not flexible and rigid in practice.	0.705	1.23	.425	1	1.23	.427	1	1.36	.505	1
30. Overall I found the suites to be usable for starting a mining SME.	0.703	4.13	.815	4	4.56	.548	5	3.73	.647	4

Usage (questions 24 - 30)

The results presented in table 6-4 indicate that Usage of the Studio was positive. The participants were optimistic about the acceptance of the studio in the start-up project with mode 4 in questions 24 and 25. The respondents acknowledged the positive usage of the studio features and suites represented the context of mining in Uganda with mode 4 in question 26. The participants were willing to use of the studio (suites and guidelines) when starting a mining enterprise and remarked that the stakeholders were interested in the study with modes 1 in questions 27 and 28. The respondents felt that the guidelines were flexible and also indicated that they were specifically tailored to the Uganda context lacking generalizability as indicated with mode 1 in question 29. Overall, the participants found the studio to be usable for starting a mining enterprise with mode 4 in question 30.

Table 6-5: Analysis of Variances (ANOVA) Usefulness Tests for Central, Western, and Eastern Participants

Usefulness questions		Sum of Squares	Degree of Freedom (df)	Mean Square	F-Value	Sig. (P- values)
1. Using the suites helped me better understand the general start-up processes targeted in this project.	Between Groups	2.545	4	.636	1.550	.197
	Within Groups	28.319	69	.410		
	Total	30.865	73			
2. Using the suites helped me better understand the activities involved in starting a mining enterprise.	Between Groups	1.351	4	.338	.790	.536
	Within Groups	29.514	69	.428		
	Total	30.865	73			
3. The studio is not useful in improving the start-up process.	Between Groups	.425	3	.142	.326	.806
	Within Groups	30.439	70	.435		
	Total	30.865	73			
4. Is there anything that you expected from the guidelines that was not included?	Between Groups	1.309	4	.327	.764	.552
	Within Groups	29.556	69	.428		
	Total	30.865	73			
5. I think that the mining enterprise start-up process among the stakeholders cannot be improved with the studio.	Between Groups	.451	3	.150	.346	.792
	Within Groups	30.414	70	.434		
	Total	30.865	73			
6. Using the suites did not improve the quality of my work.	Between Groups	1.551	4	.388	.912	.462
	Within Groups	29.314	69	.425		
	Total	30.865	73			
7. The studio did not improve my understanding of the key issues involved when starting a mining SME.	Between Groups	.576	3	.192	.444	.722
	Within Groups	30.289	70	.433		
	Total	30.865	73			
8. Using the studio helped me accomplish my work better and faster than otherwise.	Between Groups	.784	3	.261	.608	.612
	Within Groups	30.081	70	.430		
	Total	30.865	73			
9. The suites reflect the actual issues that are involved in starting a mining enterprise.	Between Groups	.874	4	.219	.503	.734
	Within Groups	29.990	69	.435		
	Total	30.865	73			
10. Using the suites facilitated my access to mining start-up issues.	Between Groups	1.080	2	.540	1.288	.282
	Within Groups	29.785	71	.420		
	Total	30.865	73			
11. There is added value in using the studio (suites and guidelines).	Between Groups	1.340	2	.670	1.611	.207
	Within Groups	29.525	71	.416		
	Total	30.865	73			
12. I would not prefer to carry out my mining enterprise start-up without the studio.	Between Groups	2.349	4	.587	1.421	.236
	Within Groups	28.516	69	.413		
	Total	30.865	73			
13. The suites do not really address the issues I expected.	Between Groups	1.007	3	.336	.787	.505
	Within Groups	29.858	70	.427		
	Total	30.865	73			

Usefulness (questions 1 – 13)

The results presented in table 6-5 indicate that most participants valued the mining enterprise start-up studio, as it helped them gain insights into the start-up processes targeted in this case with no significant P- values among the three regions; central, western and eastern in questions 1 and 2. The participants agreed and were satisfied with the guidelines importance in improving the start-up process in questions 3, 4, 5 and 11 with no significance as indicated by the p-values greater than 0.0017. Most participants agreed that the studio improved the quality of their work and enhanced their understanding of the mining enterprise start-up issues (question 6 and 7) with no significant p-values). Using the studio helped the respondents' accomplish the start-up process better and faster and the suites reflected the actual issues involved in starting a mining enterprise in this case with no significant p-values for questions 8, 9 and 13. The participants preferred to carry out the mining SME start-up activities with the help of the suites and stakeholder involved as the services were accessible and addressed the start-up issues with no significant p-values for questions 12 and 13. The low F –values indicate that there is a greater difference within the groups as compared to between the groups for all the participants on questions 1-13.

Table 6-6 Analysis of Variances (ANOVA) Usability Tests for Central, Western, and Eastern Participants

Usability questions		Sum of Squares	Degree of Freedom (df)	Mean Square	F- Value	Sig. (P- values)
14. The suites used simple language that is easily understandable.	Between Groups	.224	3	.075	.171	.916
	Within Groups	30.641	70	.438		
	Total	30.865	73			
15. The suites did not contain ambiguous words that make it complex to understand.	Between Groups	.735	2	.367	.866	.425
	Within Groups	30.130	71	.424		
	Total	30.865	73			
16. The suites catered for definition of complex words.	Between Groups	2.537	4	.634	1.545	.199
	Within Groups	28.328	69	.411		
	Total	30.865	73			
17. Overall it was easy to understand the suites.	Between Groups	.268	3	.089	.204	.893
	Within Groups	30.597	70	.437		
	Total	30.865	73			
18. I can communicate the suites and guidelines to other people.	Between Groups	.049	2	.024	.056	.945
	Within Groups	30.816	71	.434		
	Total	30.865	73			
19. I would prefer working with the studio (suites and steps).	Between Groups	1.130	2	.565	1.349	.266
	Within Groups	29.735	71	.419		
	Total	30.865	73			
20. I did not always seek clarification when using the suites.	Between Groups	1.789	3	.596	1.435	.240
	Within Groups	29.076	70	.415		
	Total	30.865	73			
21. I was not often confused when using the suites.	Between Groups	1.707	3	.569	1.366	.260
	Within Groups	29.157	70	.417		
	Total	30.865	73			
22. I did not need professional support in using the suites.	Between Groups	1.108	3	.369	.869	.461
	Within Groups	29.757	70	.425		
	Total	30.865	73			
23. The language used to present the suites and steps was not understandable	Between Groups	1.760	2	.880	2.146	.124
	Within Groups	29.105	71	.410		
	Total	30.865	73			

Usability (questions 14 - 23)

The answers presented in table 6-6 show a positive feedback. The studio used simple language that was understandable and did not contain ambiguous words with no significant p-values (questions 14 and 15). However, the suites did not contain ambiguous words that made it less complex to understand as shown in question 16 among the participants. Overall, the participants found the suites easy to understand as they could communicate the studio to other people in this case with no significant p-values for both questions 17 and 18. Additionally, the respondents' preferred working in the studio with no significant p-values in question 19. The participants did not always seek clarification, professional support and were not confused when using the studio as the language presented was understandable

with no significant p-values for questions 20, 21, 22 and 23. The low F –values indicate that there is a greater difference within the groups as compared to between the groups for all the participants on questions 14-23.

Table 6-7 Analysis of Variances (ANOVA) Usability Tests for Central, Western, and Eastern Participants

Usage questions		Sum of Squares	Degree of Freedom (df)	Mean Square	F-Value	Sig. (P- values)
24. In your view, can the studio be accepted in a real start-up project?	Between Groups	.829	3	.276	.644	.589
	Within Groups	30.036	70	.429		
	Total	30.865	73			
25. I am optimistic of using the guidelines when starting a mining SME.	Between Groups	.615	3	.205	.474	.701
	Within Groups	30.250	70	.432		
	Total	30.865	73			
26. Usage of the studio features and suites did not correctly represent the relevant context of mining in Uganda.	Between Groups	1.213	3	.404	.954	.419
	Within Groups	29.652	70	.424		
	Total	30.865	73			
27. I will not use the suites when starting a mining enterprise.	Between Groups	1.755	4	.439	1.040	.393
	Within Groups	29.109	69	.422		
	Total	30.865	73			
28. The usage of the guidelines are too high level and hard to be implemented.	Between Groups	.147	3	.049	.111	.953
	Within Groups	30.718	70	.439		
	Total	30.865	73			
29. The guidelines are not flexible and rigid in practice.	Between Groups	2.405	4	.601	1.458	.225
	Within Groups	28.460	69	.412		
	Total	30.865	73			
30. Overall I found the suites to be usable for starting a mining SME	Between Groups	2.149	3	.716	1.746	.166
	Within Groups	28.716	70	.410		
	Total	30.865	73			

Usage (questions 24 - 30)

The results presented in Table 6-7 indicate that usage of the studio was positive. The participants were optimistic of the acceptance of the studio in the start-up project with no significant p-values in questions 24 and 25. The respondents acknowledged the positive usage of the studio features and suites represented the context of mining in Uganda with no significant p-values in question 26. The participants were willing to use the studio when starting a mining enterprise and remarked that the stakeholders were interested in the study with no significant p-values in questions 27 and 28. The respondents felt that the guidelines were flexible and also indicated that they were specifically tailored to the Uganda context lacking generalizability as indicated with no significant p-values in question 29.

Overall, the participants found the studio to be usable for starting a mining enterprise with no significant p-values in question 30. The low F –values indicate that there is a greater difference within the groups as compared to between the groups for all the participants on questions 24-30.

General insights

The insights in this section were derived from the evaluation of the studio presented in the tables and explanations above.

- **Insight 1:** In terms of usefulness, usability and usage, there is no significant difference in using the studio to enhance the enterprise start-up decision processes between the central, western and eastern miners.
- **Insight 2:** The interaction between the users depended on the level of infrastructure and literacy of the participants.
- **Insight 3:** Provision of a web-based and stand alone solution improved access to the enterprise start-up services in response to inadequate data and voice network in rural areas. This makes the solution location independent.
- **Insight 4:** The availability of guidance to the enterprise start-up studio complimented the ease of understanding the enterprise start-up process.
- **Insight 5:** When the enterprise start-up decision process is coordinated through a shared space, an improvement is obtained as compared to not using the interactive environment.
- **Insight 6:** The access and response time to enterprise start-up services was reduced using the solution as compared to having to travel to the head quarters for start-up services.
- **Insight 7:** The simplicity of the solution, with its interactive support features enhanced the ease of interaction of the approach.
- **Insight 8:** The mining enterprise decision process involved the actors namely: the mining entrepreneurs, mining consultants and DGSM representatives.
- **Insight 9:** The indigenous language translation was necessary in improving the understandability and participation of the stakeholders in the enterprise start-up process.

From the discussion, the researcher picked out key aspects namely; accessibility, guidance, improved quality of work, and service access time in decision making. These relate to usefulness, data access, integration and web connection, speedy computation, quality support and overcoming cognitive limits of

a solution (Yonazi, 2010; Keen & Sol, 2008; Muniafu, 2007; Turban et al., 2004; Simon, 1977). A location independent solution was also considered as a key attribute because of the mining entrepreneurs' mobility and scattered population in Uganda. Additionally, the researcher picked out more attributes namely; simplicity, ease of interaction, interactive support in decision making, literacy, and language. These aspects relate to interactive, ease of use, humans control the machine, stakeholder involvement in decision making process (Bankole et al., 2011; Qureshi & Keen, 2009; Okello-Obura et al., 2009; Keen & Sol, 2008). Concerning the alignment of the studio to the DGSM way of working, the DGSM participants confirmed that the enterprise start-up services conform to their standards i.e. regulations and updated mineral distribution (DGSM, 2009). Consequently, the researcher observed that the studio was perceived to be usable because of the services: simplicity, ease of interaction and interactive support in the studio.

6.3 Conclusions

This chapter presented details of the evaluation that was carried out on the studio in providing enhancement to the enterprise start-up decision process. The evaluation followed the recommendations given by Hevner (2007), concerning the introduction of the studio to the respondents. The aim of carrying out the tests was to assess the use of the studio in improving the mining enterprise start-up decision process.

The qualitative observations drawn from the case study showed that the participants had a positive evaluation of the studio. The stakeholders appreciated the use of ICT in developing mining enterprise start-up services. The concept of the studio-based approach to facilitate mining enterprise start-up service development was considered to have been successfully tested and established. The researcher also noted that encouraging collaboration between the stakeholders and service providers is crucial to the long term usage of solution in improving mining enterprise start-up services. Overall, the researcher can conclude that testing of the studio and the case study objective were achieved by collecting feedback on usefulness, usability and usage.

CHAPTER 7. EPILOGUE

In this research, we recognized that small and medium enterprises play a vital role in most economies. However, the SME start-up decision process remains challenging due to inadequate agile start-up services. The objective of this study was to develop a studio to facilitate the enterprise start-up decision process in Uganda. In this chapter, we reflect upon the research, discuss the research findings, generalizability of the research and provide directions for further research.

7.1 Research findings

This section presents the research findings by discussing and answering the research questions. The central research objective was to develop decision enhanced SME start-up services in rural areas of Uganda. In order to develop such decision enhanced services, we formulated several research questions in chapter one.

Research questions

The research was aimed at providing an approach that can be used to facilitate and improve the development of mining enterprise start-up services. There was need to study the main issues to be considered in developing such services. To enable us to achieve this, we formulated a central research question: *how can we provide support for enhancing mining small and medium enterprise start-ups in rural areas.* The research question was aimed at enabling us to come up with a studio that could be used to improve mining enterprise start-up services in rural areas. The research question was partly answered in chapter one and further elaborated in chapter two. In this research, we suggest that Decision Enhancement Services provides support to improve the SME start-ups in rural areas.

Research question one

The first research question was formulated as: *What are the current and key issues in small and medium enterprise start-ups?* This research question was intended to help us get a detailed understanding of the issues of start-up small and medium enterprises. The importance of this question was established in chapters one and three. The former addressed enterprise start-ups and ICT while the latter explored the enterprise start-up issues to gain an in-depth understanding of the context. Based on information from the exploratory study, the main causes of the mining SME start-up problems were attributed to (a) internal factors (inaccessibility to mineral identification, fragmented and

incomplete information on land cost and ownership, regulations, middlemen, mining plan, financial), and (b) external factors (environmental and institutional).

(a) Internal factors

The factors that affect the internal environment under which mining enterprise start-up decisions are made include;

- *Inaccessibility to mineral identification information*

There is a need for relevant and quality information for SME start-ups in Uganda. The mining SMEs are characterized by fragmented and incomplete information in the start-up process. Information that is necessary for decision making in the start-up activities is very crucial. There is a need for information on identifying mineral deposits, quality and quantity of the remaining ore. Inaccessibility to such services is characterized by the non-existent and if they exist, they are out-dated and unavailable whenever required by the entrepreneurs. The start-up services are inaccessible to the mining entrepreneurs in rural areas.

- *Information on land cost and ownership issues*

Similar to the previous item, there is need for information on land cost and ownership. The land belongs to individuals therefore it is necessary for entrepreneurs to obtain information on land ownership. In the exploratory study, it was noted that the mining entrepreneurs lack information on alternative methods of land possession and costs involved. This affects the entrepreneurs' start-up decision process, therefore there is a need for a structured way on disseminating procedures.

- *The legal process to acquire a mine*

Due to inaccessibility and lack of information on regulatory issues, the entrepreneurs face problems on attaining legal processes to acquire mines. The entrepreneurs face challenges of access to information on licensing, enterprise registration, and environmental impact assessment.

- *Linking mining entrepreneurs to customers by eliminating the middlemen*

The entrepreneurs face problems of linking to the customers in the diaspora. The middlemen play a vital role in the marketing of miners' products, and information distribution on land availability. The middlemen exploit the entrepreneur's lack of information on the available customers therefore the need to improve on linking the entrepreneur to the customer.

- *Mining plan creation*

A mining plan is one of the pre-requisites for the license and bank loan acquisition. Creating a mining plan involves issues of production, marketing, and mining method alternatives. The categories of people in need of start-up services are average with majority living below the poverty line. Therefore facilitating the mining enterprise start-up mining plan creation procedure is challenging.

- *Financial problems*

The entrepreneurs face problems of financing, loan acquisition, cost benefit analysis and return on investment. The mining entrepreneurs often get start-up financial loans from banks and micro-finance schemes. However, the entrepreneurs face problems of systematically counting the expenses in relation to the profits from mining activities. The entrepreneurs attribute the financial decision problems to inadequate book keeping and operation skills.

(b) External factors

This consists of factors within the mining enterprise start-up external environment. These categories influence the entrepreneurs' start-up decision in availing information to feed the start-up decision process and alternatives to chose from.

- *The interaction between the mining entrepreneurs and the service providers*

Due to the changing environment and mining entrepreneur needs the start-up services can be dynamic in their interaction when working with different stakeholders. There is inadequate interaction and communication between the mining entrepreneurs and the service providers. This affects the entrepreneurs' start-up decision problems. In order for the mining enterprises to survive, it is necessary to get a cheap and effective way of service delivery and interaction among the service providers and entrepreneurs. This means that the services development should be flexible and reusable to cater for the changing needs and roles of the stakeholders.

- *Guidance*

The entrepreneurs start their businesses on trial and error mechanisms, experience and luck, therefore the need for guidance in the mining enterprise start-up process. The entrepreneurs are mainly driven by the need to survive which explained why they need adequate guidance on mining SME procedures. Creating and maintaining such guidance services is not easy since the mining entrepreneurs are resources constrained and not willing to pay for such services.

- *Infrastructure for access to services*

There is a general challenge of poor physical infrastructure in Uganda. This is characterized by unreliable and unaffordable connection services. These include the low telecommunication signal and power black outs. This makes it difficult to transfer services to the mining entrepreneurs in rural areas.

- *Institutional aspects*

Among the institutional aspects, the start-up services were unclear and outdated. Due to the competitive business environment, the mining entrepreneurs do not trust the sharing information with other entrepreneurs to maintain competitive advantage. This makes it difficult to create rapport of who provides what services and share the existing services with start-up entrepreneurs.

- *External challenges*

Mining enterprises in Uganda are buffeted by problems regarding rising operating costs, volatile exchange rates and high costs of fuel. Other external factors include; market demands and supply, competitors, international mineral prices, foreign exchange rates, high taxation from government, political instability and world wide economic instability.

These challenges make it difficult to provide support to improve and facilitate the development of enterprise start-up services among the stakeholders. These identified issues are in line with the characteristics of mining SMEs in Uganda described by Kato (2010) and Hinton et al., (2009) as low production, poor infrastructure, poor mechanization, labour and poor management skills. In light of the challenges presented in this section, we state that the development of mining enterprise start-up services is difficult. There is a need to facilitate the development of mining enterprise start-up services.

Once the start-up obstacles have been overcome, ICT has shown a positive effect of development. In this section, we explain how the start-up studio can enable development if appropriately deployed taking into consideration the entrepreneurs differing decision needs using the information technology for development (IT4D) model by Qureshi (2005). The start-up studio brings about access to information and expertise, increasing competitiveness and access to markets, administrative efficiencies through e-government, learning and labour productivity which leads to poverty reduction (Qureshi, 2005). At a *macro economic level* there is a reduction in transaction costs, increased market coverage, and improved competitiveness using the pricing services. There is *social inclusion and political empowerment* through e-government solutions using the regulatory services. *Education*

through knowledge networks, learning, start-up training and materials using the regulatory – know how to services. *Health care efficiencies* enabled through early identification and treatment of epidemics, and clinical distribution information using the regulatory – know how to services. The mining SME start-up studio involved an increase in human development, macro-economic growth through the use of the tools and technologies. This leads to an increase in per capita income and perpetuate an increase in the social and economic development.

Research question two

Research question two states that: *What are the concepts that constitute the support for small and medium enterprise start-ups?* This research question was intended to help us gain a sound theoretical background on the important concepts regarding developing mining SME start-up services. To address this question, we have provided a literature review on SME start-ups and decision enhancement. In undertaking the literature review, we aimed for the following three aspects: defining SME start-up decisions, identifying the theoretical concepts guiding SME start-up decisions and establishing the necessity to apply decision enhancement services proposed in this thesis. To answer the second research question, we discuss the following. Firstly that the large body of research on SME start-up decisions included many attempts at addressing various start-up decisions that are important to the start-up process. However, based on Keen & Sol (2008), start-up decision processes that lack agility are far from achieving successful start-ups decisions. There is need to engage in a more controlled approach to decision making within SME start-up processes by systematic identification of the best outcomes to problems as a means of improvement to decisions. There exists no literature associated with using decision enhancement services proposed in this thesis in improving SME start-up decision processes.

Research question three

After understanding the challenges and relevant concepts of enterprise start-ups, the third issue that the research addressed was to look at the ways to improve the enterprise start-up process. The third research question was formulated as: *How can we support the process for enhancing small and medium enterprise start-ups in Uganda?* This research question directed the researcher to articulate the enterprise start-up studio using the “four ways of” framework (Sol, 1988) to appreciate the enterprise start-up studio (see chapter 4 and chapter 5 for the Uganda Miners Studio implementation).

The *way of thinking* delineates how we looked at the problem situation in starting a mining SME and provide principles on which to base the solution. Decision enhanced services and studio principles are rooted in our belief and understanding of the multiple actor perspective and appropriate technology in the mining enterprise start-up process supported in the regional service centers (see chapter 4 section 4.2). *The way of controlling* looks at adaptive strategies appropriate for enterprise start-up decision enhancement in multi-actor settings (see chapter 4 section 4.3). *The way of working* addresses the enterprise start-up decision process guidelines and services in the studio (see chapter 4 section 4.4). *The way of modelling* involved the suites needed to enhance the start-up decision process. The suites specify the enterprise start-up services in the studio (see chapter 4 section 4.5). Chapter 5 presents the Uganda Miners Studio. We discuss the technological implementation choices involved in developing the suites with the enterprise start-up services. This is followed by the studio description which displays the suites and describes the technological choices involved in its implementation. We then present the studio's verification which documents the implementation checks by various actors.

Research question four

The fourth research question was formulated as: *What is the added value of the studio in the process of SME start-up?* We wanted to know whether using the enterprise start-up studio could improve the enterprise start-up decision process. This research question was addressed in chapter 6, in which we present the results of the evaluation of the studio. We carried out an evaluation of the start-up studio mainly using questionnaires with a reflection on the studio. The studio was tested based on the three U's (Keen & Sol, 2008) in a case study setting. In regard to usefulness, the studio helped the users understand the general enterprise start-up processes better and activities involved in starting a mining enterprise. The studio was useful in improving the start-up process and the guidelines met the users' expectations. The results also show considerable improvement in the quality of start-up decision process using the studio. The studio enabled the users accomplish the start-up process better and faster than otherwise by reflecting the actual issues involved in starting a mining enterprise. Using the studio facilitated the users' access to the enterprise start-up issues and added value to the start-up decision process. In regard to the usability, the studio used simple and easily understandable language. The studio did not contain ambiguous words and catered for definition of complex words. The users were able to communicate the studio to other entrepreneurs and preferred working with the studio. The users hardly sought clarification and were not confused when using the studio. Concerning

the usage of the studio, the users were willing to accept the studio in a real start-up project and were optimistic about using the guidelines in the enterprise start-up process. The studio contained contextual content about mining enterprise start-ups in Uganda and lacked generalization to other sectors and regions. Chapter 6 results suggest that the Uganda Miners Studio improves the enterprise start-up decision processes as compared to not using traditional start-up methods (Ejiri & Sol, 2012). The participants were satisfied with the decision enhancement services in the development of mining enterprise start-up services. The participants were confident with the usefulness, usability and usage of the Uganda Miners Studio.

7.2 Generalizability of the research

This section presents a reflection of this research based on the three cycles in design science research (Hevner, 2004). In this research, the *relevancy cycle* involved identifying the mining enterprise start-up decision issues as presented in the previous section. We can generalize that the Uganda miners' enterprise start-up issues are contextual and comparable to other developing economies in Africa with similar characteristics.

According to Hevner (2004) design science research must create an innovative artefact in the *design cycle*. This research involved building an enterprise start-up studio design as articulated using the ways of framework. The studio design was built and evaluated iteratively to include the studio processes (recipes) and artefact. This was built to address the enterprise start-up needs. We suggest that the enterprise start-up design studio enhances the enterprise start-up decision problems. However, the solution was context based and we noted that the female entrepreneurs are influential and more relevant to the sustainability of the enterprise start-ups as compared to the male entrepreneurs.

In the *rigor cycle*, design science research relies upon the application of the rigorous methods in both the construction and evaluation of the design studio. Firstly, we can state that the decision enhancement services improve the enterprise start-ups as described in the studio design, Uganda Miners Studio implementation and the studio testing. The studio design aimed at providing ways of improving the enterprise start-ups as described in the start-up recipes and start-up suites. The Uganda Miners Studio was verified and our results provide a better understanding of enhancing enterprise start-ups in Uganda.

Secondly, using the knowledge networking concept, we describe how the start-up studio contributes to the knowledge base of information technology for development (Qureshi et al., 2009). In order for knowledge networking to enable development to take place, knowledge needs to be activated. Here the start-up studio enables miners to find the knowledge and information they need through documents, people and processes to start-up successful businesses. In addition, activation of knowledge involves bringing knowledge into action. The knowledge activation framework proposed by Qureshi & Keen (2005) suggests that the demand for knowledge within a network is driven by knowledge “identities” that determine the willingness to communicate and share knowledge. The mining entrepreneurs benefit from knowledge activation by enabling access to new markets and supporting administrative efficiencies (Qureshi, 2005). According to Qureshi (ibid), in order for knowledge networking to be effective, information literacy needs to be continuously developed. The greater the mining entrepreneurs’ ability to communicate and understand electronic communication, the more they engage in activating knowledge. We state that the studio was used in improving the mining enterprises start-ups, however there is a need to roll out the studio to other enterprise start-up domains.

In this research, discussions were necessary in improving enterprise start-ups. The interactive discussions have implications for improving enterprise start-ups. In this thesis, we further elaborate on constructive dialogue for enhancing mining enterprise start-ups. The communication involved interaction of actors relevant to improving mining enterprise start-ups in Uganda. The participants must maintain acceptance to participate so that the members are able to share their knowledge. We observe that in order to have successful enterprise start-up decision processes, discussions for innovation are important. However, the actors need to have vast knowledge and expertise in the start-up contextual issues for useful participation.

While we cannot fully generalize our findings, we observe that the enterprise start-up studio has been derived from the start-up best practices and recommendations from relevant inter-disciplinary research and it has been tested to address the entrepreneurs’ start-up challenges. These factors make a basis to conclude that the start-up studio can be useful and usable for all mining enterprise start-ups that experience similar start-up decision problems. However, it is recommended that when using the enterprise start-up studio, practitioners should adjust the studio to different application situations. This

implies that even though this research has focused on enhancing mining enterprise start-ups in Uganda, this studio can be used in other mining enterprise start-ups taking into consideration the uniqueness of the context of application. Such uniqueness may include the regional service managers, the female start-up entrepreneurs'. Beyond the unique contextual issues, it is our observation that while the basic elements in the start-up recipes remain the same, creativity and flexibility in response to the uniqueness contributes to the enterprises start-up success.

7.3 Further research and recommendations

During this research, several issues that need further attention arose. If addressed, they will advance the research on enhancing enterprise start-up in developing countries. However, given the time and resource constraints, the researcher was unable to address all these issues presented in this section.

- **Recommendation 1:** There is need to test the Uganda Miners Studio with more users over a longer duration. Keen & Sol (2008) suggest that usage of the studio is important especially over a long period of time. The Uganda Miners Studio was developed and tested with one hundred and two stakeholders' in comparison to Uganda's vast population. In the evaluation of the studio, the usage was tested in a given period, hence the recommendation to carry out longer periods of testing for usage of the enterprise start-up studio.
- **Recommendation 2:** There is a need to develop and evaluate a Luganda, Runyakitara and Acholi version of the Uganda Miners Studio. In the context of Uganda, there is a need to formulate the studio in other local languages for ease of understanding and usage in the rural communities. This was not developed in the study due to limited time and resources.
- **Recommendation 3:** To further this research, it is important to carry out studies on the generalizability of issues in different SME sectors to utilize the existing studio. A step in this direction would establish the usage of the studio in other SMEs.
- **Recommendation 4:** There is need to further this research by looking at the enterprise start-up studio in relation to the knowledge networking concepts.

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APPENDICES

APPENDIX 1: EXPLORATORY STUDY QUESTIONS

APPENDIX 1A: FOCUS GROUP DISCUSSION QUESTIONS

1. What industrial minerals do you mine?
2. What problems do you usually face in acquisition of mining licenses for the various locations of minerals? Like prospective licenses. So how do you usually handle such issues on licensing?
3. Land: Ownership of land verse the minerals found in a particular location? How is this problem to you as a miner? How do you usually have conflicts in this sect?
4. Loyalties: As miners the government is to return loyalties of 3% to you are you aware of it? If so then have you even gotten any of it? If not what do you suggest as a means of getting this loyalties distributed to the miners.
5. Supply: Do you supply any major large scale miners with your mineral? What problems do you usually face towards getting loyalties and other payments in time? How do you handle issues of competition in order to survive?
6. Concerning environmental impact assessment, how do you handle such changes as a medium or small scale miner? What suggestions would you make to such policy makers?
7. Water: This is a key item during mining, as a miner what issues do you face with water and sanitation? How do you solve such problems?
8. Location: Do you have any problems with getting minerals in forest reserves and national parks? If so how do you solve this conflicting issue and what advise do you have concerning this problem.
9. Health hazards: concerning the mineral mined are there any health hazards you face as miners within this sector? How do you handle such mining problems if so what can be done to assist you solve these health issues?
10. Gender: how many women work at your mining sites? What are the key challenges they face? What of child labour how do you handle this issue?
11. Are there any problems you face as miners?

APPENDIX 1B: INTERVIEW FOR THE EXPLORATORY STUDY

1. WHAT IS YOUR GENDER?

A - Female

B - Male

2. WHAT IS YOUR CURRENT POSITION IN THE MINING ENTERPRISE?

A - Enterprise Owner

B - Site Manager

3. HOW LONG HAVE BEEN IN THE MINING ENTERPRISE?

A - Less than 1 Year

B - 1 -3 Years

C - 3 -6 Years

D - 6 - 10 Years

E - Over 10 Years

4. WHAT MINERAL DOES YOUR ENTERPRISE MINE?

A - Sand

B - Clay

C - Stones (Quarry)

D - Kaolin

E - Limestone

F - Salt

5. WHAT MAJOR DECISION PROBLEM DID YOU GET INVOLVED IN WHEN STARTING YOUR MINING ENTERPRISE?

A - No Decision

B - Land decisions

C - Mining location and licensing decisions

D - Mining plan decisions

E - Gender and labour decisions

F - Marketing decisions

G - Financial decisions

H - Mining methods decisions

I - All decisions above

J - Any 5 to 6 decisions

K - Any 3-4 decisions

L - Any 1-2 decisions

6. HOW DID YOU HANDLE THE OWN OR POSSESS THE LAND WHERE YOUR MINERAL IS LOCATED?
- A - Bought
 - B - Lease
 - C - Joint Venture
7. HOW DID YOU IDENTIFY THE MINERAL AT YOUR MINING LOCATION?
- A - Department of Geology Survey and Mines (DGSM)
 - B - Family or friends
 - C - Mining consultant or meteorologists
8. DO YOU HAVE A MINING LICENCE (PROSPECTIVE LICENCE, EXCLUSIVE PROSEPECTIVE LICENCE, MINING LEASE LICENCE, MINERAL DEALERS LICENCE)
- A - Yes
 - B - No
9. HOW DID YOU ACCESS THE LICENCING INFORMATION?
- How do you access this licensing information?
- A - Unlicensed
 - B - Department of Geology Survey and Mines
 - C - Family or friends
 - D - Mining consultant or meteorologists
10. DO YOU HAVE A MINING PLAN?
- A - Yes
 - B - No
11. DO YOU HAVE AN ENVIRONMENTAL IMPACT ASSESSMENT CERTIFICATE?
- A - Yes
 - B - No
12. WHAT TYPE OF MINING IS CARRIED OUT AT YOUR MINING SITE?
- A - Surface Mining (Extraction of mineral from near the surface.)
 - B - Underground mining (Extraction of ore located vertically or horizontal tunnels into the ore body)
13. IS YOUR MINING ENTERPRISE MECHANIZED OR NOT?
- A - Yes (Use machines like excavators)
 - B - No (wood, spades, axes, hammer)
14. WHAT MINING METHOD(S) DO YOU USE WHEN EXTRACTING THE ORE?
- A - Drilling
 - B - Blasting with explosives (Use of explosives for rock breaking / fragmentation.)
 - C - Rock wedging (inserting a wedge in the holes and then pound to create fractures to separate rock)
 - D - Heating and cracking (Building a fire near the rock, then it cracks)
 - E - Hydraulic Rock splitting (using a rock splitter)

15. DO YOU COVER OR UTILISE ANY PITS AFTER MINING?

- A - Yes
- B - No

16. WHAT PLACER MINING METHODS ARE APPLIED AT YOUR MINING SITE? (PLACER DEPOSITIS ARE USUALLY WEAKLY CONSOLIDATED IN SHALLOW PITS THAN HARD ROCK)

- A - Open pit methods (Dig and water makes the ore easy to mine)
- B - Hydraulic monitoring (High water pressure through a hose)
- C - Dredging (Involves excavating sediments from the bottom of rivers or swarms)

17. DO YOU HAVE ANY PIPED METRED WATER AT YOUR MINING SITE?

- A - Yes
- B - No

18. DO YOU USE ELECTRICITY AT YOUR MINING SITE?

- A - Yes
- B - No

19. HOW BEST WOULD YOU LIKE THIS INFORMATION AVAILED TO YOU?

- A - Computers
- B - Mobile phone
- C - Books

20. I HAVE EXPERIENCE WITH USING THE FOLLOWING ICT SERVICES

- A - E-MAIL
- B - WEB BROWISING
- C - VOICE (MOBILE OR FIXED LINE)
- D - SMS
- E - ICT PROFESSIONAL
- F - NONE OF THE ABOVE
- G - ALL THE ABOVE

21. THE LEVEL OF MY ICT USAGE SKILLS ARE?

- A - LOW
- B - MODERATE
- C - GOOD
- D - PROFICIENT

22. WHICH OTHER EXTERNAL PROBLEMS AFFECTS YOUR DECISION MAKING PROCESS?(ITEMS OUT OF YOUR CONTROL)

- A - MARKET DEMANDS AND SUPPLY
- B - INTERNATIONAL PRICE FLATIONS
- C - VOLATILE EXCHANGE RATE
- D - TAXATION

- E - GOVERNMENT REGULATIONS
- F - POLITICAL INSTABILITY
- G - WORLD WIDE ECONOMIC INSTABILITY
- H - NONE OF THE ABOVE
- I - ANY 1 - 2 ITEMS
- J - ANY 3 - 4 ITEMS
- K - ANY 5 - 7 ITEMS

23. WHAT REGION OF THE COUNTRY DO YOU COME FROM?

- A - NORTHERN – GULU
- B - CENTRAL- KAMPALA, MUKONO, JINJA, ENTEBBE
- C - WESTERN - KASESE, FORTPORTAL
- D - SOUTHERN - MBARARA, NTUNGAMO, KABALE, KISORO

24. HOW MANY EMPLOYEES WORK AT YOUR MINING ENTERPRISE?

- A - LESS THAN 50 WORKERS
- B - 51 - 500 WORKERS
- C - MORE THAN 500 WORKERS

25. WHAT FINANCIAL PROBLEMS ARE FACED IN DECISION MAKING WHEN STARTING A MINING ENTERPRISE?

- A - LOANS FROM THE BANKS
- B - INCREASED COSTS AS A RESULT OF MIDDLEMEN
- C - INVESTMENT DECISIONS - CALCULATING PROFITS
- D - MIDDLEMEN THAT CAUSE INCREASED COSTS

APPENDIX 2: EVALUATION QUESTIONNAIRE

SECTION A: USEFULNESS USABILITY AND USAGE

Table 1: Perceived useful questionnaire

Usefulness questions	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
1. Using the suites helped me better understand the general start-up processes targeted in this project.					
2. Using the suites assisted me understand the activities involved in starting a mining enterprise.					
3. The studio is not useful in improving the start-up process.					
4. Is there anything that you expected from the guidelines that was not included?					
5. I think that the mining enterprise start-up process among the stakeholders cannot be improved with the studio.					
6. Using the suites did not improve the quality of my work.					
7. The studio did not improve my understanding of the key issues in starting a mining enterprise.					
8. Using the studio helped me accomplish my work better and faster than otherwise.					
9. The suites reflect the actual issues that are involved in starting a mining enterprise.					
10. Using the suites facilitated my access to mining start-up issues.					
11. There is added value in using the studio (suites and guidelines).					
12. I would not prefer to carry out my mining enterprise start-up without the studio.					
13. The suites do not really address the issues I expected.					

Table 2: Perceived useful questionnaire

Usability questions	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
14. The suites used simple language that is easily understandable.					
15. The suites did not contain ambiguous words that make it complex to understand.					
16. The suites catered for definition of complex words.					
17. Overall it was easy to understand the suites.					
18. I can communicate the suites and guidelines to other people.					
19. I would prefer working with the studio (suites and guidelines).					
20. I did not always seek clarification when using the suites.					
21. I was not often confused when using the suites.					
22. I did not need professional support in using the suites.					
23. The language used to present the suites and guidelines was not understandable					

Table 3: Perceived useful questionnaire

Usage questions	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
24. In your view, can the studio be accepted in a real start-up project?					
25. I am optimistic of using the guidelines when starting a mining enterprise.					
26. Usage of the studio features and suites did not correctly represent the relevant context of mining in Uganda.					
27. I will not use the suites when starting a mining enterprise.					
28. The usage of the guidelines are too high level and hard to be implemented.					
29. The guidelines are not flexible and rigid in practice.					
30. Overall I found the suites to be usable for starting a mining enterprise.					

SECTION B

Additional Information:

Please feel free to provide us with any information in the space below:

.....
.....
.....

We thank you very much for your contributions you have made today. We will make sure that we make them available to you as soon as possible. Please feel free to contact us if you think there is any other thing that should have been considered.

Thank you for your time

LIST OF ABBREVIATIONS

3 U's	Usefulness, Usability and Usage
AJAX	Asynchronous Javascript and extensible Mark-up Language
ANOVA	Analysis of Variances
AOA	Articles of Association
BCS	Bachelor of Computer Science
BE	Business Engineering
BOU	Bank of Uganda
CBA	Cost Benefit Analysis
CBD	Component Based Development
CBE	Collaborative Business Engineering
CIA	Central Intelligence Agency
CMS	Content Management System
CWS	Common Wealth Secretariat
DES	Decision Enhancement Services
DF	Degree of Freedom
DGSM	Department of Geology Survey and Mines
DSIS	Design Science in Information Systems
EIA	Environment Impact Assessment
EIB	European Investment Bank
EPL	Exclusive Prospective Licence
EUg	Enterprise Uganda
FAQ's	Frequently Asked Questions
FGDs	Focus Group Discussions
GB	Gigabytes
GDP	Gross Domestic Product
GEM	Global Entrepreneurship Monitor
GIS	Geographical Information System
GSS	Group Support System
HCF	Hima Cement Factory

HICSS	Hawaii International Conference on System Sciences
HTML	Hyper Text Mark-up Language
ICT	Information and Communication Technology
ISI	Intelligence and Security Informatics
KCCL	Kasese Cobalt Company Limited
LAMP	Linux Apache MySQL PHP
LC	Local Council
M	Mode
MB	Mega Byte
MDGs	Millennium Development Goals
MDL	Mineral Dealers Licence
ML	Mining Lease
MoGLSD	Ministry of Gender, Labour and Social Development
MoLG	Ministry of Local Government
MoLUD	Ministry of Lands and Urban Development
MoLUP	Ministry of Lands and Urban Planning
MoPLS	Ministry of Planning Lands and Survey
MoTI	Ministry of Trade and Industry
MOU	Memorandum of Understanding
MRMCBP	Mineral Resources Management and Capacity Building Project
MUST	University of Science and Technology
MySQL	My Structured Query Language
NEMA	National Environmental Management Authority
NFA	National Forestry Authority
NWSC	National Water and Sewage Corporation
OECD	Organization for Economic Cooperation and Development
PEAP	Poverty Eradication and Alleviation Programs
PHP	PHP Hypertext Preprocessor
PL	Prospective Licence
PSFU	Private Sector Foundation Uganda
<i>R&D</i>	<i>Research and Development</i>

RAM	Random Access Memory
ROI	Return On Investment
RUG	Rijksuniversiteit Groningen
SDA	Start-up Decision Agility
SET	Social Exchange Theory
SLA	Service Level Agreements
SME	Small and Medium Enterprises
SMMRP	Sustainable Management of Mineral Resources Project
SPSS	Statistical Package for the Social Sciences
STEEP	Social, Technological, Economic, Ecological and Political
TCE	Transaction Cost Economics
TIN	Tax Identification Number
UBOS	Uganda Bureau of Statistics
UCC	Uganda Communications Commission
UGX	Uganda Shillings
UIA	Uganda Investment Authority
UMFPED	Uganda, Ministry of Finance, Planning and Economic Development
UML	Unified Modelling Language
UMS	Uganda Miners Studio
UMSSSN	Uganda Martyrs Senior Secondary School, Namugongo
UNBS	Uganda National Bureau of Standards
URA	Uganda Revenue Authority
UWA	Uganda Wild-life Authority
WBG	World Bank Group
X	Mean
XML	Extensible Mark-up Language
α	Cronbach's alpha values
σ	Standard deviation

SUMMARY

Small and Medium Enterprises are essential components of economic development in many countries, particularly in developing countries. The ever changing economy and environment requires entrepreneurs to be able to use information better, learn faster and proactively foster innovation while managing risks. Enterprise start-up is still a challenge for many economies especially in Uganda. Despite the growing pressure for enterprise start-up survival, the near collapse of SMEs remains a challenge due to limited infrastructures, and total remoteness. As demand for enterprise start-up services increases, rural areas experience problems that have ready made solutions from the developed world. Such solutions need considerable adaptation and tailoring to the particular contextual needs in developing countries.

Literature suggests that using ICT to support the enterprise start-up process is a way of dealing with some of the start-up service delivery problems faced in rural areas. However, given that the enterprise start-up decision processes are adhoc, vague, and unknown, the entrepreneur relies on intuition, six sense, guess work and chance to make a decision. There is a valid case for presenting this argument given that the context is characterized mainly by small, spatially isolated stakeholders for whom enterprise start-up services result in costly, time consuming activities. In order to overcome the challenges of enterprise start-ups occasioned by lack of stakeholder involvement, distance from service centers, ignorance of procedures and regulations, it is important to use Decision Enhancement Services to enhance the enterprise start-up process. Within the enterprise start-up studio it is possible to address various start-up issues before moving on to training, planning and actual use during the enterprise start-up decision process.

Based on this reasoning, we formulated the research objective as follows “*To develop decision enhanced small and medium enterprise start-ups services in rural areas of Uganda*”. To meet this objective, we developed four research questions as follows:

- *What are the current and key issues in small and medium enterprise start-ups in Uganda?*
- *What are the concepts that constitute the support for small and medium enterprise start-ups?*
- *How can we support the process for enhancing small and medium enterprise start-ups in Uganda?*
- *What is the added value of the studio in the process of SME start-up?*

In this research, we focused on the utility of a studio to facilitate and improve the development of mining small and medium enterprise start-ups.

Research methodology

This research applied an inductive hypothetical strategy that is suitable to study, support theory building, and evaluate a studio to facilitate enhancement of SME start-ups. This strategy consists of the phases; initiation, abstraction, theory building, implementation and evaluation. Knowledge about mining SME start-up problems in Uganda was obtained using an exploratory study. The exploratory study enabled us to get a better understanding of the mining SME issues to be considered. Parallel to this, we started a literature exploration to get an overview of the theories that guide the SME start-up process. We evaluated the studio based on the dimensions of usefulness, usability and usage using a case study setting in the regional service centers in solving the problems faced in mining SME start-ups in Uganda.

An exploratory case study was carried out in the rift valley areas of Uganda where mining is the major activity. The study enabled us to understand the main issues in mining SME start-up services in these rural areas and to determine how ICT could be used to improve in services in these areas. The case study revealed that the development of such services is complex because of the environmental and technological constraints. Information on mining SME start-ups in rural areas is limited or non-existent. SMEs operate in resource constrained business environments characterized by fragmented, incomplete and inconsistent start-up services. The challenges that affected mining SME start-up decisions included internal factors (inaccessibility to mineral identification information, fragmented and incomplete information on land cost and ownership, regulations, middlemen, mining plan, financial), and (b) external factors (environmental and institutional).

A literature review was conducted to identify a number of initial theories that could be applied to the problem under investigation that is development of enterprise start-up services. We learnt that the theories guiding the enterprise start-ups handle technology, people and process in isolation. However, they do not provide an integration of technology, people and process to enhance the start-up decision process in this context. Decision enhancement services fuse technology, people and process in an interactive environment to enhance the enterprise start-ups. The concept of decision enhancement

services provides a solution that facilitates a balanced integral approach for enterprise start-ups. Additionally, the literature review showed that the development of such start-up services involves complex activities and involves stakeholders who have different goals and objectives in the design process. From the start-up theories discussed none was rooted in problem solving thinking.

Uganda Miners Studio

We applied the “four ways of” framework; way of thinking, way of controlling, way of working and way of modelling to articulate an enterprise start-up studio design (Sol, 1988). Decision Enhancement Services facilitate the enterprise start-ups as the way of thinking. Enterprise start-up decision enhancement services are composed of people, technology and process. The enterprise start-up control measures involve adaptive strategies appropriate for enterprise start-up decision enhancement in multi-actor settings as the way of controlling. The way of working specifies the steps involved in the mining enterprise start-up process. The activities involve include mineral identification; land ownership, regulatory, mining plan creation, pricing, and financial analysis. The guidelines specify each activity which involves stakeholders using appropriate tools in the start-up decision process. The way of modelling involved the suites needed to enhance the start-up decision process. The suites specify the enterprise start-up services in the studio. We implemented the Uganda Miners Studio to address the enterprise start-up needs.

We carried out an evaluation of the start-up studio using questionnaires with a reflection on the studio. The studio was tested based on the three U’s (Keen & Sol, 2008) in a case study setting. The participants were satisfied with the studio-based approach in the development of mining enterprise start-up services. The participants were confident with the usefulness, usability and usage of the suites in the studio. Overall, the enterprise start-up studio was presented to determine the value it adds to the start-up process. Various insights were derived from the studio testing process;

- In terms of usefulness, usability and usage, there was no significant difference in using the studio to enhance the enterprise start-up process between the central and western; central and eastern miners.
- The interaction between the users depended on the level of infrastructure and literacy of the participants.

- Provision of a web-based and stand alone solution improved on the ease of access to the enterprise start-up services in response to inadequate data and voice network in rural areas. This made the solution location independent.
- The availability of guidance to the enterprise start-up studio complimented the ease of understanding the enterprise start-up process.
- When the enterprise start-up decision process is coordinated through a shared space, a significant improvement is obtained as compared to without using the interactive environment.
- The access and response time to enterprise start-up services was reduced using the solution as compared to having to travel to the head quarters for start-up services.
- The simplicity and interactive support features in the solution made it easy to interact with the studio.
- The mining enterprise decision process depended on the stakeholder involvement of the mining entrepreneurs, mining consultants and DGSM representatives.
- The indigenous language translation was necessary in improving the understandability and participation of the stakeholders in the enterprise start-up process.

We followed the design science research philosophy in this study by creating and evaluating the enterprise start-up studio (artefact). We obtained the mining enterprise internal and external characteristics that affect start-ups in Uganda using exploratory studies. These are comparable to those faced in developing countries with similar mining enterprises. The enterprise start-up studio design was then created based on the ways of framework. The Uganda Miners Studio was implemented comprising of the suites addressing the enterprise start-up needs. The studio was evaluated iteratively and we suggest that the enterprise start-up studio (suites and recipes) enhances the enterprise start-up decision problems. Additionally, we suggest that discussions for innovation are vital to the improvement of enterprise start-ups.

Conclusions and recommendations

- Based on the research, we conclude that the enterprise start-up studio is useful and usable in facilitating mining enterprise start-up processes. The studio contains services that support and facilitate the stakeholders to explore new ways of start-up service development in the mining enterprise start-up process. By developing and evaluating the enterprise start-up studio in Uganda, we achieved the

objectives of this study. Specific areas that we recommend for future research are 1) Testing the enterprise start-up studio with more users over a longer period of time, 2) Develop and evaluate a Luganda, Runyakitara and Acholi version of the approach, 3) To carry out research into the generalizability of the SME start-up issues of the studio so that different sectors utilize the existing studio, 4) There is need to further this research by looking at the enterprise start-up studio in relation to the knowledge networking concepts.

SAMENVATTING (DUTCH SUMMARY)

Kleine en middelgrote ondernemingen vormen een essentieel onderdeel in de economische ontwikkeling van veel landen, in het bijzonder in die van ontwikkelingslanden. De steeds veranderende economie vraagt van ondernemers een beter gebruik van informatie, het vermogen om nog sneller te leren en het op een pro-actieve manier stimuleren van innovatie, waarbij de risico's beheersbaar blijven. In veel economieën, vooral in Uganda, is het opstarten van een bedrijf nog steeds een moeilijk proces. Ondanks een beleid dat in toenemende mate gericht is op het laten overleven van pas opgestarte ondernemingen, blijft de neergang van de MKB-sector zich in Uganda voortzetten door de gebrekkige infrastructuur en de afgelegen ligging van deze bedrijven. De vraag naar serviceorganisaties die de ondernemingen kunnen ondersteunen in hun opstartfase neemt dan ook toe. Aangezien de huidige service-centra echter veelal Westerse organisaties zijn die kant en klare oplossingen bieden gericht op de situatie in ontwikkelde landen, ondervinden de Ugandese lokale ondernemingen problemen bij het realiseren ervan. De geboden richtlijnen zouden daarom aanzienlijk moeten worden aangepast zodat zij beter zijn afgestemd op de lokale context.

De literatuur geeft aan dat voor opstartende bedrijven in rurale gebieden het gebruik van ICT een manier kan zijn om beter toegang te krijgen tot informatie-servicediensten. Aangezien de ondernemers in dit soort gebieden doorgaans niet goed weten hoe zij een opstartproces moeten aanpakken, zijn de beslissingen die zij maken veelal vaag en adhoc, en gebaseerd op intuïtie, giswerk, en toeval. Deze vaststelling is steekhoudend tegen de achtergrond van een context die wordt gekarakteriseerd door kleine, geïsoleerde actoren voor wie het benaderen van een opstart-serviceorganisatie een dure en tijdrovende aangelegenheid is. Wij constateerden een duidelijke behoefte aan verbeteringen in het opstartproces van kleine en middelgrote bedrijven in de Ugandese regio. Door te investeren in ICT kan er de ondernemingen in de rurale gebieden gemakkelijker toegang worden geboden tot ondersteuning tijdens hun opstart-fase. Om de knelpunten op te lossen met betrekking tot huidige informatieservice-bureaus en de opstartproblemen van de bedrijven - bijvoorbeeld door het gebrek aan betrokkenheid van de stakeholders, de grote afstand tussen de ondernemingen en de service-centra, en de onbekendheid met procedures en regels - zijn nieuwe steuntrajecten op dit gebied van groot belang. Deze zouden zich, alvorens in te gaan op zaken als planning en besluitvorming, in eerste instantie

kunnen richten op de verschillende aspecten die aan de orde komen in het opstartproces van een onderneming.

Op basis van het bovenstaande hebben wij de volgende onderzoeksdoelstelling geformuleerd: *“Het ontwikkelen van informatieservices die kleine en middelgrote bedrijven in de rurale gebieden in Uganda kunnen ondersteunen in hun opstartproces.”* Om deze doelstelling te realiseren ontwikkelden wij de volgende onderzoeksvragen:

- *Wat zijn momenteel de belangrijkste aspecten in de opstartfase van kleine en middelgrote bedrijven in Uganda?*
- *Welke concepten worden aangedragen ter ondersteuning van de opstart van kleine en middelgrote bedrijven?*
- *Hoe kan het verbeteren van het opstartproces van kleine en middelgrote bedrijven in Uganda worden ondersteund?*
- *Wat is de toegevoegde waarde van de ‘studio’ in het opstartproces van deze kleine en middelgrote bedrijven?*

In dit onderzoek is de faciliterende rol van de studio onderzocht in het ontwikkelen en verbeteren van de informatiedienstverlening gericht op de ondersteuning van opstartende kleine en middelgrote mijnbouwbedrijven in Uganda.

Onderzoeksmethodologie

Bij de behandeling van de onderzoeksvragen hebben wij op basis van een inductief-hypothetische aanpak en enkele ontwerptechnieken een studio ontworpen en getest. Deze studio was erop gericht het opstartproces van MKB's in de mijnbouwsector in Uganda te verbeteren. Door middel van een verkennende casus-studie is er informatie verzameld over de algemene kenmerken van de dienstverlening voor opstartende mijnbouwbedrijven in Uganda. Vervolgens verrichtten wij een literatuurstudie om de belangrijkste aspecten van het opstartproces te inventariseren. Dit overzicht diende als uitgangspunt van ons onderzoek en stelde ons in staat om onze bevindingen in de verkennende studie nog scherper te formuleren. De verkennende studie gaf ons tevens meer inzicht in de meest relevante punten waarop de serviceorganisaties zich concentreerden met betrekking tot het opstartproces van de mijnbouwondernemingen. Voorts evalueerden we de rol van de studio in de

Ugandese context. Door middel van enkele casus-studies zijn de volgende dimensies van de opstartstudio onderzocht: nut, bruikbaarheid, en aandeel in het oplossen van de problemen waarmee de MKB's in de mijnbouwsector in Uganda gedurende hun opstart mee te maken hebben.

Serviceorganisaties voor MKB's in de mijnbouwsector in Uganda

Ons onderzoek betrof een verkennende casus-studie in de slenk-gebieden van Uganda, waar mijnbouw de belangrijkste economische activiteit is. De studie gaf ons inzicht in de voornaamste kenmerken van de opstart-serviceorganisaties in deze regio. Op basis hiervan konden wij ideeën ontwikkelen ten aanzien van het gebruik van ICT ter verbetering van de dienstverlening. Voorts liet de studie zien dat door de omgevings- en technologische beperkingen het ontwikkelen van dienstencentra hier een complexe aangelegenheid is. Informatie over de opstart van MKB's in de mijnbouw is in deze rurale gebieden maar op beperkte schaal of helemaal niet te krijgen. MKB's bevinden zich over het algemeen op lokaties zonder veel faciliteiten, waar de dienstensector gefragmenteerd en inconsistent is, ook op het gebied van opstartondersteuning. Zo was één van de factoren die de beslissing beïnvloedden om een mijnbouwbedrijf op te zetten de moeilijke toegang tot dienstverlenende instanties die advies geven over zaken zoals mineralen-distributie, alternatieve vormen van grondbezit, en vergunningen en voorschriften. Andere factoren die het opstartproces bemoeilijkten bleken de afwezigheid van centra die bedrijven adviseren bij het opstellen van een ondernemingsplan, hetgeen wettelijk is verplicht, de hoge tarieven van bemiddelaars, het gebrek aan ondersteuning bij zaken zoals kosten-baten-analyses, rendementsprognoses en voorspellingen, en het ontbreken van interactie met dienstverleners en andere stakeholders. Een belangrijk punt van aandacht in dit onderzoek was dan ook het zoeken naar manieren van ICT-gebruik om de mijnbouwbedrijven in de rurale gebieden te ondersteunen bij het oplossen van hun opstartproblemen en het coördineren van hun opstartprocessen.

Ten einde een aantal theorieën te verzamelen die konden worden toegepast op onze onderzoeksdoelstelling: het ontwikkelen van opstart-serviceorganisaties voor mijnbouwbedrijven in Uganda, hebben wij een literatuuronderzoek gedaan. Wij concludeerden dat de gangbare theorieën opstartprocessen slechts benaderen op basis van drie opzichzelfstaande dimensies: technologie, mensen en proces. De theorieën bieden in deze context geen instrument voor de verbetering van het opstartproces waarin de drie aspecten zijn geïntegreerd. De studio-methode echter, laat de dimensies

technologie, mensen en proces samensmelten in een interactieve omgeving die verbeteringen in de opstartprocessen van bedrijven stimuleert. Het concept van besluitvormings-verbeterende dienstverlening vormt de basis voor een evenwichtige integrale methode die is afgeleid van de huidige theorieën over de besluitvorming in opstart-processen van bedrijven. Het literatuuronderzoek liet tevens zien dat de ontwikkeling van een dergelijke dienstverlening een complex proces is waarin actoren met verschillende doelstellingen een rol spelen. Van alle ontwikkeltrajecten uit de literatuur is er geen enkele gebaseerd op probleem-oplossend denken. Om een traject voor de ontwikkeling van dienstverlening op te zetten dat uitgaat van probleemoplossing, was het daarom wenselijk om uit te gaan van een perspectief gericht op het verbeteren van het besluitvormingsproces.

Opstartstudio voor mijnbouw-ondernemingen

Op basis van de verkennende studie en het literatuuronderzoek zijn een aantal criteria geformuleerd waaraan de opstartstudio moest voldoen om het opstartproces van de mijnbouw-ondernemingen te kunnen verbeteren. Deze waren: de aanwezigheid van een 'communicatie-suite' waar de bedrijven met een opstartverzoek worden geholpen door middel van service-tools, toegang tot de serviceorganisatie, en een aantal opstartprogramma's zonder bugs en virussen. Verder diende de studio over een grafische gebruikersomgeving te beschikken die toegang verschaft tot de opstart-serviceorganisaties en communicatiemogelijkheden biedt voor de stakeholders: de serviceorganisaties en de gebruikers. Ook moest de gebruikersomgeving gebruiksvriendelijk zijn zodat de ondernemers met hun aanwezige computerkennis in de talen Engels of Shahili de opstart-services eenvoudig konden benaderen. Tenslotte diende er een handleiding beschikbaar te zijn.

Onderliggende visie

Om een oplossing te bieden voor de opstartproblemen van bedrijven in de mijnbouwsector in Uganda hebben wij een studio ontworpen, die voor deze ondernemingen de toegang tot ondersteunende diensten vergemakkelijkt. Hierbij zijn wij uitgegaan van het idee dat met behulp van deze studio de bedrijfsopstart en de hieraan gerelateerde besluitvormingsprocessen kunnen worden verbeterd. Deze verbetering was gebaseerd op een combinatie van de dimensies technologie, mensen, en proces.

Procesbeheersing

De instrumenten die wij hebben gebruikt voor het realiseren van ons steuntraject betroffen project- en procesmanagement-technieken. Aangezien wij te maken hadden met een omgeving waarin meerdere actoren een rol speelden, leenden procesmanagement-toepassingen zich goed voor het coördineren

van de besluitvormingsprocessen en het betrekken van de stakeholders in het opstartproces. Door middel van deze techniek kregen wij inzicht in het complexe spectrum van waarden, doelstellingen en belangen van de verschillende stakeholders in een dynamische omgeving. Projectmanagement werd toegepast in het ontwikkelen van de opstart-dienstenservice voor de ondernemingen in onze casus. Voor mijnbouwondernemingen in Uganda dient het opstartproces te worden doorlopen volgens de structuren en regels gedicteerd door het Department of Geology Survey and Mines (Department van Geologisch Onderzoek en Mijnbouw). Andere overheidsrichtlijnen betreffen het gebruik van Service Level Agreements (SLA) en prestatie-indicatoren. Voorts worden ook serviceorganisaties aan 'gezondheidschecks' onderworpen om zo een duurzame ontwikkeling van de dienstverlening te realiseren.

Methode en modellen

Het in kaart brengen van het opstartproces van de middelgrote en kleine bedrijven in Uganda en de verbeteringen hierin is mede uitgevoerd met behulp van grafische modellen. Eerst hebben wij de verschillende stappen van het opstart-traject gespecificeerd. Deze betreffen: de identificatie van mineralen, grondbezit, het opstellen van een gereguleerd ondernemingsplan, het vaststellen van prijzen, en het maken van een financiële analyse. Bij al deze stappen werden de stakeholders betrokken, en het gehele opstart-traject werd uitgevoerd met behulp van bovengenoemde instrumenten. De stappen hadden een iteratief karakter en waren onderling aan elkaar gerelateerd. De verbeteringen in de opstartprocessen van de ondernemingen zijn vervolgens grafisch weergegeven door middel van stroomschema's en activiteitendiagrammen.

De opstart-serviceorganisaties in de suites zijn geselecteerd op basis van dezelfde criteria die golden voor de servicecentra voor andere sectoren in de rurale gebieden, namelijk:

- Grond-acquisitie (mineralen-identificatie en het verschaffen van informatie met betrekking tot de beschikbaarheid van grond)
- Ondersteuning bij het opstellen van een gereguleerd ondernemingsplan
- Ondersteuning bij het vaststellen van prijzen en het maken van financiële analyses
- Communicatie (aanvraag- en antwoord-services)

De studio ontworpen in deze studie is gebaseerd op bovengenoemde vier componenten, die fungeerden als criteria waaraan de diensten moesten voldoen om te kunnen voorzien in de

informatiebehoeften van de MKB-bedrijven in de Ugandese mijnbouwsector.

De studio werd vervolgens getest in de casus-omgeving op de volgende kenmerken: nut, bruikbaarheid en gebruik. Hierbij baseerden wij ons op de vier bovengenoemde criteria. De toetsing liet zien hoe de verschillende servicediensten konden worden gebruikt ter verbetering van het opstartproces. Onze algemene conclusie is dat de studio beantwoordt aan de functionele criteria voor de dienstverlening in deze context en dat dit instrument een toegevoegde waarde heeft in de ondersteuning van het opstartproces van bedrijven in de mijnbouwsector in Uganda. Voorts waren de deelnemers aan het onderzoek het erover eens dat de studio beleidsvormers meer bewust maakt van de stand van zaken met betrekking tot de informatiedienstverlening in deze sector. De goede resultaten zijn tevens bereikt door het koppelen van stakeholders aan de serviceorganisaties. Door functionele ICT-toepassingen werden de stakeholders in staat gesteld om informatie met elkaar uit te wisselen en meer inzicht te krijgen in elkaars ideeën en standpunten. Zo waren alle deelnemers tevreden met het aandeel van de studio in de verbetering van het opstartproces van de mijnbouwondernemingen. Zij waren het erover eens dat de aangereikte richtlijnen voor het opstartproces goed werkbaar waren. Samengevat, tijdens de evaluatie gaven de deelnemers aan onze studie te kennen dat zij vertrouwen hadden in de werking van de studio en dat zij geen obstakels waren tegengekomen in het gebruik ervan.

Conclusies en vervolgonderzoek

Op basis van het onderzoek concluderen wij dat de bedrijfsopstart-studio een nuttig en bruikbaar instrument is om de opstartprocessen van mijnbouwondernemingen in Uganda in goede banen te leiden. Voorts biedt de studio de verschillende stakeholders de mogelijkheid om onderling nieuwe manieren te verkennen waarop de ontwikkeling van servicediensten voor opstartende mijnbouwbedrijven nog beter gestalte kan krijgen. Wij kunnen vaststellen dat met het ontwerpen en evalueren van de studio wij onze onderzoeksdoelstelling hebben bereikt. Ons onderzoek heeft verscheidene aandachtspunten opgeleverd. Met betrekking tot enkele van deze is vervolgonderzoek gewenst. Deze zijn: 1) het testen van de studio onder een groter aantal gebruikers gedurende een langere periode, 2) het ontwikkelen en evalueren van studio's in de dialecten Luganda en Runyakitara en 3) het onderzoeken van de mogelijkheid tot generalisatie om te bepalen of de studio ook in andere bedrijfssectoren kan worden gebruikt. 4) het onderzoeken verder door te kijken naar de onderneming opstarten studio ten opzichte van de kennis netwerkconcepten.

CURRICULUM VITAE

Annabella Habinka Basaza Ejiri was born on 10th July 1981 in Kilembe, Kasese, Uganda. She completed A' level at Uganda Martyrs Senior Secondary School, Namugongo (UMSSSN) in 2000. Annabella studied a Bachelor of Computer Science (BCS) at Mbarara University of Science and Technology (MUST) in Mbarara, Uganda. During her BCS degree, she did her internship with Hima Cement Factory (HCF), Kasese Cobalt Company Limited (KCCL) both in Kasese. After graduating with an Upper 2nd Class honours degree in 2004, she was employed as a teaching assistant at MUST. During her BCS her research project was "A Computerized Record tracking system for Mbarara Taxi Owners and Drivers Association". In 2005-2007, Annabella studied at Makerere University – Faculty of Computing and Information Technology where she graduated with a first class Masters in Information Systems. Her master thesis was entitled "A Client Server Access Control System for Higher Education Institutions: A Magnetic Card Mechanism". In December 2007, Annabella started her PhD research at the University of Groningen in collaboration with Makerere University. Part of her research has been published in international conferences. She also organized several tutorials and supervised several students during their bachelor projects with MUST.