

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/376784731>

# Decision Enhancement Services for Small and Medium Enterprise Start-ups in Uganda

Conference Paper · December 2023

---

CITATIONS

0

---

READS

27

2 authors:



**Annabella Habinka Dorothy Basaza-Ejiri**  
Makerere University

45 PUBLICATIONS 414 CITATIONS

SEE PROFILE



**Henk G. Sol**  
University of Groningen

214 PUBLICATIONS 2,193 CITATIONS

SEE PROFILE

# Decision Enhancement Services for Small and Medium Enterprise Start-ups in Uganda

Annabella Habinka Ejiri  
ICS, Mbarara University of Science  
and Technology  
[annabinka@must.ac.ug](mailto:annabinka@must.ac.ug)

Henk G. Sol  
Faculty of Economics and Business  
Groningen University  
[h.g.sol@rug.nl](mailto:h.g.sol@rug.nl)

## Abstract

*While start-up firms 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 mining Small and Medium Enterprises (SME) is a challenging task in Uganda. Research on SME start-up support is limitedly available. Technology is envisaged to facilitate enterprise start-ups. However, there is still acknowledged deficiency in Uganda due to discrete approaches of technology, stakeholders and processes. There is lack of a generalized and systematic means to SME start-up that emphasizes communication and prioritization. Hence, this design science 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. Results from this study suggest that the start-up decision processes can be improved using technology in rural areas.*

## 1. Introduction

The dynamic nature of Small and Medium Enterprise (SME) start-ups are affected by the increased demand for Start-up Decision Agility (SDA). Start up decision agility is defined as 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 [16] [20]. SDA is therefore paramount for enterprises to remain competitive, and sustainable in an ever changing business environment. This has caused SME start-up government initiatives focus on Information Communication and Technology (ICT) to enable the start-up decision process flexibly in response to the continuous changing business needs [17][21] [51][52][53][60]. In Uganda, the following definitions

for small and medium enterprises were adopted. A Small Enterprise employs a maximum of 50 people, annual sales/revenue turnover of maximum 360 million Uganda Shillings (UGX), (130,000 United States Dollars (USD) or 103,000 Euros (€)) and total assets of maximum 360 million UGX. A Medium Enterprise employs 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 [28][57][59].

In Uganda, the SME start-up decision 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 [17][57][60]. Dissolving a problem involves changing the nature and environment of the entity in which the problem is embedded so as to remove the problem. 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 collapse are high [56]. Keen and Sol argue that, the enterprises that sustain success develop decision disciplines as an integral culture [32]. There is need to engage in a more controlled approach to decision making within the SME start-up process by systematic identification of the best outcomes to problems as a means of improvement to decisions. This will enable the entrepreneurs to focus on the decision priorities in the SME start-up process.

Decision agility for business start-up improvements has become a fast growing research area. There is a need for stakeholder involvement, collaboration and coordination for successful and continuous SME start-up improvement [56]. SME start-ups have been a subject of interest in the recent decade due to the economy credit crunch, governments have thus given priority to support SME start-ups using ICT support service centers in Uganda [21] [58]. This is so because of the cross-cutting nature of SME start-up processes;

several people taking part at different stages and thus any changes in an activity affects the entire process.

Coordinating the start-up decision process to continuously adapt to the new conditions needs to be carefully managed to avoid chaos. Start-up decision processes remain a key challenge and commonly manifested as poor stakeholder involvement which leads to pre-mature enterprise collapse and closure [31] [65]. This paper investigates the start-up decision challenges that affect mining SMEs in Uganda in an exploratory study that involved interviews and Focus Group Discussions (FGD) with ninety mining stakeholders in rural areas of Uganda. The challenges that affected mining SME start-up decisions included limited accessibility to start-up services like mineral distribution services, alternative methods of land ownership services, regulatory and licensing services. There was also difficulty in developing a mining strategy as a prerequisite in the legalization process, increased costs as a result of middlemen, limited support for cost benefit analysis and return on investment projections or forecasting services, and there was no interaction with the service providers and other stakeholders. Involving stakeholders in the start-up decision process would increase their commitment and acceptability of the start-up activity adjustments. This research therefore sought to answer the question: *How can we provide support for enhancing mining SME start-ups in rural areas of Uganda?*

In the next section, we present the theoretical perspectives guiding SME start-up decisions. We also give a description of decision enhancement services. In answering the research question, a decision enhancement design was tested following the research approach described in section three. Section four consequently presents the start-up design which is followed by the evaluation and testing of results of the solution in a rural context of Uganda as described in section five. Finally chapter six includes conclusions and future work.

## 2. Theoretical perspectives guiding SME start-up decisions

The enterprise start-up process is a course of action that involves functions, activities and actions associated with identifying and evaluating perceived opportunities and bringing together of resources necessary for the successful formation of a new firm to pursue and seize the opportunities [7][8][10][36][62]. There are two major theories of SME start-up development namely: life cycle theory and the complexity theory as compared by different scholars

(Table 1). Scholars use the organizational life cycle theory to investigate the issue of start-up development.

Although the lifecycle and complexity theories provide some support in understanding the start-up decisions [56], the existence of an inter-organizational relationship and stakeholder involvement during the start-up stages implies additional challenges that make it incapable of providing adequate support for start-up decision agility.

**Table 1: Life cycle and complexity theory comparison adapted from (56)**

Life Cycle Theory	Complexity Theory
Organizations are stable systems and can therefore achieve a state of balance. The environment is predictable and change is an exception.	Start-up process is an individual's viewpoint. Organizations are dissipative structures, and are always in states of imbalance. The environment is unpredictable and change is the rule
Startup development is progressive and predictable process.	Start-up development is a chaotic process.
The start-up process has different stages with diverse problems. An organization should possess multiple management skills to make decisions.	The start-up process consists of a series of new emergent orders, and an organization exhibits discontinuous growth.
Start-ups may encounter crises during each stage. The ability for an enterprise to survive and continue to grow hinges upon whether it can manage these crises.	Start-ups may encounter thresholds or transitions, and a start-up can exhibit a new order only after it surmounts such a threshold.
Entrepreneurs can predict what problems the organization will encounter, map out response strategies and plan ahead of time, which eliminates all uncertainty and change.	Difficult for entrepreneurs to make advance plans because they cannot predict the problems. Entrepreneurs can rely on their vision, to guide the actions of the organization.

A number of theoretical lenses have been used to provide insight about start-up decision support. Among these are the Transaction Cost Economic (TCE) theory [63], inter-organizational theories [43][54], competitive advantage approach [44], Social Exchange Theory (SET) [33], process management approaches [12], Information systems design approaches [4], Service system approach [30] and Decision Enhancement Services (DES) [32]. Investigation of the

theories relevant to start-up decision approaches are aimed at deriving potential starting points for enterprise start-up decision processes.

TCE and inter-organizational theories address the degree of transaction, complexity, site, physical, human assets, interdependency, trust and agreements. Bureaucratic relations exist and there is a need for stakeholder involvement, coordination through exploration and exploitation of enterprise start-up alternatives [43][45]. Argyres 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 [2]. SET addresses the need for cooperation relationships, interdependency on stakeholders, interaction between individual and groups [22][41][37][33][48]. Process management emphasizes stakeholder involvement, in handling urgent matters, openness, trust, integrity and core interests [12]. 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 [46].

In absence of comprehensive integrated models and tools, incomplete decisions are faced in the SME start-up process. The current systems for carrying out enterprise start-ups are adhoc and not structured hence the need for a guiding framework and services to support the mining SME start-up decision process agility in rural areas of Uganda. Keen and Sol, emphasize that technology is to be used for administrative and analytical support coupled with quality information for enhancement of decision processes [32]. Therefore, in this paper we used the decision enhancement approach to provide support to mining enterprise start-ups in Uganda.

## 2.1. Decision enhancement services

Decision Enhancement Services (DES) utilized a studio-based approach to enhance ill-structured decision processes, presented by [32]. In this paradigm, the concept of “studio” is introduced, and this is defined as a facilitative, interactive environment for decision enhancement [32]. The goal of a studio is to help managers rehearse the future by building their comfort with and confidence in directly using appropriate, interactive tools in the decision process. Decision Enhancement Services involves the fusion of tools, processes and people to make an informed decision [32]. The studio environment enhances decision agility by creating opportunities for speedy, adaptive, coordinated and innovation among its

participants. Decision enhancement services focus on landscaping, orientation and initiation, recipes, suites and processes [32]. *Landscaping* defines the decision context, stakeholders and governance rules for the decision process. *Orientation* and initiation ensures that teams with the skills, credibility and domain expertise to attract, motivate coordinate and help the studio participants’ move to a decision commitment. *Recipes* apply to repeatable proven guidelines which may include scripts. *Suites* are the tools and technologies that are designed and implemented within a (distributed) architecture. *Processes* involve making a commitment to a decision. This approach was used in developing countries like Sub-Saharan Africa [38][39]. A set of services delivered within the suites that are deployed in a decision process was developed within the studio for mining SME start-ups.

From the above observations, DES may lead to improvement of enterprise start-up process agility by enhancing the start-up decision process. The proposed studio will consist of suites (sets of technologies) that support the enterprise start-up process. Additionally, the studio will also provide an interactive environment to support the enterprise start-up decision process alternatives by providing feedback among the stakeholders.

## 3. Research Approach

### 3.1. Research Strategy

This research derived its problem from the community, abstracted and synthesized it with an aim of understanding contextual issues that cause mining SMEs collapse within the start-up phase. According to Trochim [55] and Sol [50] an inductive hypothetical strategy is suitable for synthesis, multi-disciplinary, attempt to integrate scientific, ethical and esthetic modes of thought. In addition, it is regarded as a bottom-up approach in conducting multi-disciplinary research. This approach is suitable when dealing with ill-structured problems or when seeking to define problems.

The inductive hypothetical research strategy consists of five steps namely initiation, abstraction, theory formulation, implementation and evaluation as explained below [50][55]. The initiation stage involves gathering information from mining SME owners and managers on the operational, administrative decision issues involved at start-up. The second step involved abstracting the essential aspects. Here, the challenges faced by the miners were analyzed to get the key issues. Requirements were then derived from literature and the challenges. Based on the requirements, the

essential components were classified to get their interactions in the global design stage in the theory formulation stage. A studio instantiation comprised of a prototype and sets of guidelines derived from the design were developed in the implementation phase. This was then taken to mining enterprise stakeholders for testing in the final phase.

### 3.2. Research Philosophy

In order to design a generic framework for improving the decision process of starting a mining SME, we followed the design science research philosophy. This method consists of three cycles namely: the relevance, design and rigor cycles [23][24][25]. We chose this method because it aims at handling ill-structured problems by producing artefacts that contribute to the body of knowledge and are relevant to the community [9][23][64]. In this research, design science was used to emphasize the relationships between the environment, existing knowledgebase and our research project. A review of theories, methods, practices in mining SME start-ups and information systems was done with an aim of positioning our research. This was done and referenced in the introduction section to ensure innovation and novelty. In the relevance cycle, we explored multiple case studies [64] to gain an in-depth understanding of the mining challenges that cause them to collapse. Secondly, the exploratory study was used to identify requirements for the proposed solution.

In the design cycle, the build and evaluate loop, a decision enhancement studio was designed and an artefact was developed in an iterative way [23][24][25]. These comprise the artefact that was deployed together with a prototype to the mining SME stakeholders during the testing and validation stage. Below are the challenges from the relevancy cycle design science approach.

### 3.3. Challenges and decision needs for mining SME start-ups in Uganda

Seven challenges that SME entrepreneurs encounter in the decision process of starting a mining enterprise in Uganda were based on an exploratory study. This involved focus group discussions and interview sessions with a total of 90 mining SME stakeholders from various mining regions of Uganda. These include mining entrepreneurs, mining consultants, mining representatives from the Department of Geology Survey and Mines (DGSM) and potential miners. Documents from government and a country wide mining workshop added more insights in identifying potential solutions. Interviews were

useful in capturing personal account of the respondents while focus group discussions were instrumental in revealing, discussing and clarifying issues and doubts. Data was collected from four regions in Uganda: central, south, western and northern. These were selected because they are in the main rift valley wings with major mining activities in Uganda. Based on information from the exploratory study, several needs for the mining SME start-up process were formulated as mentioned in the section 1.0.

#### 3.3.1 Theoretical reflection on the findings

Based on the findings and the observations made through the exploratory case study, it is very challenging to develop mining enterprise start-up services in rural areas of Uganda because of the environmental and technological constraints. The objective of this study was to use the decision enhanced services to support and improve mining SME start-up services. The information on mining SME support in rural areas is limited or non-existent. The SMEs operate in cash constrained business environments characterized by fragmented, incomplete and inconsistent information regard start-up services [29][31]. The mining SMEs cannot afford information, systems to help the competitive favourably with the large mining enterprises. Thus it was noted that to develop start-up services, they should not put financial constraints to the end user. Therefore the start-up services are best to be developed at the mining knowledge service centers within the infrastructure and attendance of the existing staff of the Department of Geology Survey and Miners to improve on their support to start-up miners. This contributes to the relevance of the research objective and the need to provide support for the development of mining enterprise services.

Flexibility: According to Muniafu [39], services for rural enterprise managers should be flexible and reusable. Simon [47] suggests that hierarchy (inflexibility) creates costs for example in the form of communication, and motivation towards achieving a goal. According to Gonzalez, [19] Information quality has the following attributes: accuracy [35], timeliness [3], relevance [1] quantity [3], completeness [57], format [27], security [34] and consistency [14].

## 4. SME start-up decision enhancement design and implementation

The theoretical basis of the requirements of the studio developed in this research is derived from the work of [15][32][39]. For effective support for

decision enhancement in the development of services is based on the 3U's; Usefulness, Usability and Usage. Requirement 1: The studio should allow for start-up request and response services.

Requirement 2: The studio should support distributed and dynamic selection of mining enterprise start-up services.

Requirement 3: The studio should facilitate effective combination of service components.

Requirement 4: The studio should support flexible and adaptive value added services.

Requirement 5: The studio should provide a solution space (graphical user interface) for the services.

Requirement 6: The studio should facilitate effective means of communication among the different actors involved in the organizational architecture partners offering mining start-up services in order to achieve competitive advantage.

Requirement 7: The studio should provide guidelines for using the studio.

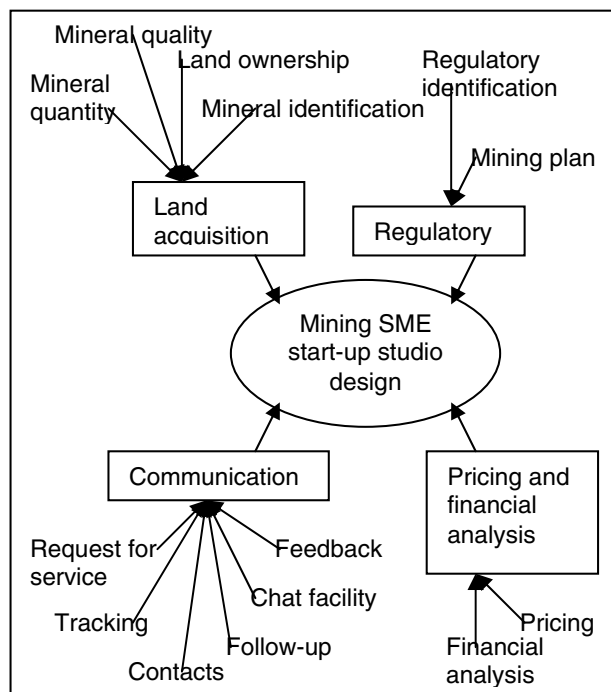
Requirement 8: The studio should be user friendly

Considering the requirements and the literature reviewed a decision enhancement studio was proposed consisting of four suites that provide the required functionality. These are the (i) land acquisition suite (ii) regulatory suite (iii) pricing suite and (iv) communication suite. Figure 1 shows the design in which the following services are deployed: landscaping, facilitation, recipes, suites and process [32].

**Landscaping:** This involves understanding the decision issues, decision makers, information resources, and the basics to model mining SME start-up process. These include the four major suites. **Facilitation:** In this stage, initiating the guidelines is carried out to ensure that the team to support the studio participants was alert. **Suites:** The aim is to get the prototype easy to access, from any location by making use of the Internet. The appropriate tools were used to provide the services needed during the enterprise start-up process. **Recipes:** In this study, we came up with guidelines to facilitate the mining enterprise start-up process. These were carefully chosen in line with the government regulatory body and the mining enterprises coupled with literature and creativity.

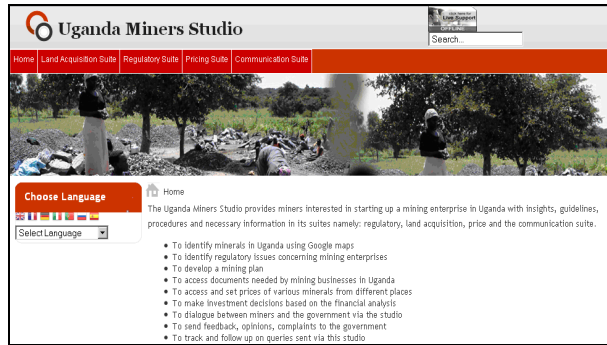
The *land acquisition suite* is responsible for enabling identification of mineral distribution services during the land acquisition process. This suite also avails alternative methods of land ownership services. The *regulatory suite* enables access to regulatory and licensing services by giving information to the start-up miners on the relevant documents for the start – up phase. It also provides support in the development of a mining plan. The *pricing and financial analysis suite* provides direct linkage of suppliers to consumers by

giving the start-up entrepreneur a beginning point for price estimation. It also supports Cost Benefit Analysis (CBA) and Return On Investment (ROI) for projections and forecasts by giving services on investment decisions. In addition, this suite also provides functionality to link the mining entrepreneurs directly with the customers thereby eliminating the middleman's role. The *communication suite* provides a means to support communication between miners (problem owners) and service providers (problem solvers) by using tools to bridge the gap between the two parties.



**Figure1: Global decision enhancement design for mining SME start-ups**

Below is the homepage of the prototype that was used in this research for purposes of a solution space in the decision enhancement studio available on <http://www.ugandaminersstudio.com>. This was used in the testing and evaluation process along side the guidelines in a studio interactive environment.



**Figure 2: Homepage of the solution space**

## 5. Findings and discussion

In this section we describe the testing that was carried out on the studio in the mining SME start-up process in Uganda. The studio was a result of the requirements in section 4 which consisted of the software services for use in developing mining enterprise start-up services that meet the miners' local needs. This research aimed at evaluating whether the studio was useful in supporting the development of mining enterprise start-up services using ICT. The case study based [65] testing approach was selected because we were introducing an IT artefact that provided facilitation for the development of mining enterprise start-up services. Based on Hevner et al., [25] we tested the studio in a controlled environment to evaluate its usefulness, usability and usage among the selected stakeholders. This aimed at testing the functionality implemented in the prototype to facilitate mining enterprise start-up services from the miners' point of view. The overall reason for carrying out the tests was that the use of the studio would provide and improve the support offered to the regional knowledge service managers in their start-up support role to the rural communities in Uganda through the application of the studio.

Usefulness, usability and usage are key aspects to be considered [32]. The usefulness aspect addresses the value that the studio adds to the decision making process in the starting of a mining SME. Perceived usefulness is the degree to which a person believes that using a particular system would enhance his or her job performance [11][40][61]. The usability aspect addresses the extent to which the studio is perceived usable by the users this includes the ease of interaction. The usage aspect relates to the actual application of the studio in the process of starting up a mining enterprise. Usage in this study was looked at the actual usage of the studio in supporting the start-up challenges from the participants' satisfaction.

When testing, the following theories were used to guide us: situation awareness rating technique [11] usability engineering lifecycle [42] and Satisfaction Attainment Theory (SAT) associated with instruments satisfaction theory [5][13].

In addition to the mining entrepreneurs, expert evaluation of the support studio involved organizing testing sessions with mining consultants and officials from the Department of Geology Survey and Mines (DGSM). This was intended to get expert evaluation from both parties to provoke discussion on the usefulness of the support studio in improving mining enterprise start-up services. The feedback from the experts in DGSM and consultants is considered key to the interview results since the experts have access to internet, are computer literate and manage the mining knowledge service centers in Uganda.

The testing took place in three regions of Uganda namely western, central and eastern. A total of 43 participants from the central region, 48 from the western region and 11 from the eastern region of Uganda were involved in the testing sessions. The central region comprises 33 mining entrepreneurs, 5 mining consultants and 5 representatives from DGSM. The western region included 34 mining entrepreneurs, 10 mining consultants, 4 representatives from DGSM. The eastern region testing sessions included 7 mining entrepreneurs, 2 mining consultants, and 2 representatives from DGSM. The results below are classified according to regions and experts.

The questionnaire had close ended questions and an open ended question for any other information or feedback. The questions were formulated as statements that aimed at focusing the respondents to explicitly make their opinion. The close ended sections were arranged in a five point likert scale to measure their perceived attitude by providing a range of responses to a given statement. This allowed the respondents express their extent to which they agree or disagree. The interviewee could answer a question based on five point scale ranging through strongly disagree (1), disagree (2), neutral (3), agree (4), to strongly agree (5) one is the least and five is the biggest range. Likert scales fall into the ordinal data category [6][26].

In this section, we present the results based on usefulness, usability and usage of the studio. The table represents Cronbach's alpha ( $\alpha$ ), mean ( $\bar{x}$ ) and standard deviation ( $\sigma$ ) and mode ( $m$ ). The mode helped indicate the attitude of the subjects concerning the quality of the proposed studio. Cronbach's alpha  $\alpha$  was used to test the reliability of the questions [26].

**Table 2: Usefulness results**

Usefulness questions (N=102)	$\alpha$	$\bar{x}$	$\sigma$	M
1. Using the suites helped me better understand the general start-up processes targeted.	0.782	3.71	1.174	4
2. Using the suites assisted me understand the activities involved in starting a mining enterprise.	0.782	3.56	1.040	3
3. The studio is not useful in improving the start-up process.	0.705	1.78	.804	1
4. Is there anything expected from the guidelines that was not included?	0.742	1.80	.784	1
5. I think that the mining enterprise start-up process among stakeholders cannot be improved in the studio.	0.742	3.58	1.112	4

**Table 3: Usability results**

Usability questions (N=102)	$\alpha$	$\bar{x}$	$\sigma$	M
6. The suites used simple language that is easily understandable.	0.714	4.05	.801	4
7. The suites did not contain ambiguous words that make it complex to understand.	0.714	1.58	.696	4
8. The suites catered for definition of complex words.	0.714	3.87	.829	4

**Table 4: Usage results**

Usage questions (N=102)	$\alpha$	$\bar{x}$	$\sigma$	M
9. In your view, can the studio be accepted in a real start-up project?	0.817	3.71	1.011	4
10. I am optimistic of using the studio when starting a mining SME.	0.817	3.72	.948	4
11. The usage of the guidelines are too high level and hard to be implemented.	0.817	1.81	.817	1

### 5.1. Discussions of the findings

The Cronbach's alpha responses were above 0.7 which indicated good reliability as shown in tables 2, 3 and 4. Perceived usefulness (questions 1 – 5). The answers presented in table 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, and 5) with mode 1 for negative statements. Perceived usability (questions 6 - 8). The results presented in table 2 show a positive feedback. The studio used simple language that was understandable and did not contain ambiguous words with mode 4 (questions 6 and 7). However, the suites did not cater for definition of some complex words as shown in question 8. The respondents felt that the suites need an added component for words like studio and suites to facilitate easy understanding by other mining entrepreneurs. Perceived usage (questions 9 - 11). The answers presented in table 2 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 9 and 10. The respondents acknowledged the positive usage of the studio features and suites represented the context of mining in Uganda with mode 4 in question 11.

On the basis of the results, the section below presents the insights derived from the testing. In terms of usefulness, usability and usage, the studio enhanced the mining enterprise start-up process. 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 hence making it location independent [43][45]. The availability of guidance to the enterprise start-up studio complimented the ease of understanding the enterprise start-up process therefore enhancing the decision 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 moving the head quarters for start-up services [3]. The simplicity of the solution, with its interactive support features improved on the ease of interaction of the approach. The mining enterprise decision process depends on the stakeholder involvement [41] of the mining entrepreneurs, mining consultants and DGSM representatives. The indigenous language translation is necessary in improving the understandability and participation of the stakeholders in the enterprise start-up process.



From the discussion we picked out key attributed namely simplicity, ease of interaction, and interactive support in the start-up decision process. In addition, the context of having the services familiar to those of DGSM [12] [46] made the studio acceptable for use within the DGSM context as the ministry over seeing the mining activities in Uganda.

## 6. Conclusion

The aim of carrying out the tests was to assess whether the use of the studio facilitates the regional knowledge service managers and service providers to come up with mining enterprise start-up services that fulfill the mining entrepreneur needs. The concept of the studio-based approach to facilitate mining enterprise start-up service development was considered to have been successfully tested and established. We intended to make a reasonable argument that using a studio improves the development of mining enterprise start-up services as compared to developing the services without the studio. We tried to do this by collecting data on perceptions of the usefulness, usability and usage of the studio from the participants by deploying the studio in a rural environment. In conclusion, this paper states that the studio was useful in supporting mining SME start-up decision process.

However, we recommend the following for future work. The tradeoffs created among the stakeholder, guidelines, and studio prototype also need to be investigated further to be able to attain complete decision enhancement. We also recommend comparative studies with other industries and sectors.

## 7. References

- [1] N. Adam, V.P. Janeja, A.V., Paliwal, B. Shafiq, C. Ulmer, and Gersabeck V. "Approach for discovering and handling crisis in a Service-Oriented Environment", IEEE International Conference on Intelligence and Security Informatics (ICISI) 2007.
- [2] N.S. Argyres, and J.P. Liebeskind, "Contractual commitments, bargaining power and governance inseparability: incorporating history into transaction cost theory", *The Academy of management Review*, 1999, 24(1) pp. 49-63.
- [3] Y. Atoji, T. Koise, and S. Nishida, "Information filtering for emergency management", IEEE International Workshop on Robot and Human Communication, 2000.
- [4] B. Boehm, A. Egyed, J. Kwan, D. Port, A. Shah, and R. Madachy, "Using the WinWin Spiral Model: A Case Study". *IEEE Computer*, 1988, 7pp. 33-44.
- [5] R.O. Briggs, G.J. de Vreege, and B.A. Reinig, "A Theory and Measurement of meeting satisfaction", Paper presented at the 36<sup>th</sup> Hawaii International Conference on Systems Sciences. Hawaii, IEEE. 2003.
- [6] R.B. Brown, and M. Saunders, "Dealings with Statistics: what you need to know", Berkshire: Open University Press. 2008.
- [7] W.D. Bygrave, "The portable MBA in entrepreneurship", 1997, New York: John Wiley and Sons.
- [8] W.D. Bygrave, "The Entrepreneurship paradigm (II): Chaos and catastrophes among quantum jumps?", *Entrepreneurship Theory and Practice*, 1989, 14(2): pp.7-30.
- [9] A.S. Carlsson, "Towards an Information System Design Research Framework: A Critical Realist Perspective", DESRIST. 2006.
- [10] J.R. Cornwall, and M.J. Naughton, "Who is the Good Entrepreneur? An Exploration within the Catholic Social Tradition", *Journal of business ethics*, 2003, 44: pp.61-75.
- [11] D.F. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology", *MIS Quarterly*, 1989, 3(3): pp.319-340.
- [12] H. De Bruijn, E. ten Heuvelhof, R.i.t.Veld. "Process Management". Kluwer Academic Publishers, Boston. 2002.
- [13] M.R. Endsley, "Automation and Situation Awareness". In R. Parasuraman M. Mouloua (Eds.) *Automation and Human performance: Theory and applications* 1996, pp.163-181.
- [14] C.W. Fisher, and B.R. Kingma, "Critically of data quality as exemplified in two disasters", *Information Management*, 2001, 39(2): pp.109-116.
- [15] N. Franke, and E. Von Hippel, Satisfying heterogeneous user needs via innovation toolkits: the case of Apache security software. *Research Policy*, 2003, 32(7): pp.1199-1215.
- [16] GEM. Autio, E. Global Entrepreneurship Monitor. *Global report on High growth entrepreneurship*. Babson College and London Business School, 2007.
- [17] M.M, Gielnik, *Opportunity Identification and exploitation: Psychological Factors for Start-Up and Success in entrepreneurship*, PhD Thesis, Leuphana Universitat Luneburg, 2010, pp. 1-140.
- [18] R.J. Glushko, *Seven Contexts for Service System Design*. *Handbook of Service Science*, Service

Science: Research and Innovations in the Service Economy, Springer, 2010, pp. 214-248.

- [19] R.A. Gonzalez, A Framework for ICT-Supported Coordinated in Crisis Response, PhD Thesis, Technische Universiteit Delft, 2010, pp. 1-218.
- [20] A. Habinka, H.G. Sol, and V., Baryamureeba, "Knowledge management for Small and Medium Enterprises in Developing Countries – Uganda: A Studio Based Approach", Conference proceedings of European Conference on Intellectual Capital: INHollanda University of Applied Sciences, Haarlem, the Netherlands: April 28 - 29 2009, ISBN: 987-1-906638-30-6CD, 2009. pp. 246-253.
- [21] G. Hatega, SME Development in Uganda Executive director PSFU, 14th March 2007 – Sheraton Hotel – Kampala, 2007, pp.1-15.
- [22] R. Heuberger, "Risk analysis in the mining industry", The Journal of the South African Institute of Mining and Metallurgy, 2005, pp.75-79.
- [23] A.R. Hevner, "A Three Cycle view of Design Science Research", Scandinavian Journal of Information Systems, 2007, 19(2): pp.87-92.
- [24] A.R. Hevner, and S. Chatterjee, Design Research in Information Systems: Theory and Practice (Integrated Series in Information Systems, 22(1) Springer, New York Dordrecht Heidelberg London, ISBN 9781441956521, 2010.
- [25] A.R. Hevner, S.T. March, J. Park and S. Ram, "Design Science in Information Systems Research", Management Information Systems Quarterly: 2004, 28 (1): pp.75-105.
- [26] S. Jamieson, "Likert scales: how to (ab) use them". Medical Education, 2004, 38(12): pp.1217-1218.
- [27] J. Jenvald, M. Morin and J.P. Kincaid, "A framework for web-based dissemination of models and lessons learned from emergency-response exercises and operations", International Journal of Emergency management, 2001, 1(1): pp.82-94.
- [28] L. Kasekende and H. Opondo, "Financing Small and Medium-Scale Enterprises (SMEs): Uganda's Experience", Bank of Uganda-Working Paper, 2003, 1(1): pp.1-12.
- [29] V. Kato, "National Artisanal and Small-Scale Mining Model Scheme, anti-poverty intervention", Unpublished Department of Geology Survey and Mines: 2010, pp.1-19.
- [30] Kar, E.A.M. Van de "Designing Mobile Information Services: An Approach for Organizations in a Value Network", PhD Thesis Delft University of Technology, The Netherlands, 2004.
- [31] C.T. Kazooba, "Causes of Small Business failure in Uganda: A Case Study from Bushenyi and Mbarara Towns", African Studies Quarterly, 2006, 8(4): pp.27-35.
- [32] P.G.W. Keen, and H.G. Sol, "Decision Enhancement Services – Rehearsing the Future for Decisions that Matter", IOS Press BV Nieuwev Hemweg 6b Amsterdam, Netherlands, ISBN 978-1-58603-837-3, 2008, pp.1-184.
- [33] T. Kern, and L. Willcocks, "Exploring information technology outsourcing relationships: theory and practice", Journal of Strategic Information Systems, 2000, 9(4) pp. 321-350.
- [34] J.K. Kim, R., Sharman, H.R. Rao, and S. Upadhyaya, "Efficiency of critical incident management systems: Instrument development and validation". Decision Support Systems, 2007, 44(1): pp.235-250.
- [35] T. Kontogiannis, "Stress and operator decision making in coping with emergencies", International Journal of Human-Computer Studies, 1996, 45(1), pp.75-104.
- [36] T.R. Kunene, "A critical analysis of entrepreneurial and business skills in SMEs in the textile and clothing industry in Johannesburg", South Africa. 2008.
- [37] J.C. Lambe, M.C. Wittmann, and R.E. Spekman, "Social exchange theory and research on business to business relational exchange", Journal of Business to Business Marketing, 2001, 8(3): pp.1-36.
- [38] N.K. Mulira, "Implementing Inter-organizational Service Systems – An Approach for emerging Networks in Volatile Context", PhD Thesis Delft University of Technology, The Netherlands, 2007.
- [39] S.M. Muniafu and E. Van De Kar, "Requirements for a suite to design e-logistics brokering services in rural areas", Journal of Design Research, 2009, 7(4): pp. 352-366.
- [40] S.M. Muniafu, 2007. "Developing ICT-enabled Services in Transition Countries – A studio-based approach for logistics brokering", PhD Thesis Delft University of Technology, The Netherlands.
- [41] B. Nabuuma, "Supporting Re-sourcing Decisions: the case of maintenance in Uganda's Downstream Oil Industry", PhD thesis, Loughborough University, 2010.
- [42] J. Nielsen, "Usability Engineering", San Francisco: Morgan Kaufmann, 1994.
- [43] B. Nooteboom, and V.A. Gilsing, "Density and Strength of Ties in Innovations Networks: A

- Competence and Governance View”, ERIM Report Series Research in Management (ED, ERIM), Rotterdam, 2004, pp 29.
- [44] M.E. Porter, *Competitive Advantage: Creating and Sustaining Superior Performance*. The Free Press. New York, 1985.
- [45] M.W. Powell, “Neither Market nor hierarchy: network forms of organization”, *Research in Organizational Behaviour* 1990, 12 pp. 295-336.
- [46] A.P. Sage and J.E. Armstrong jr. “Introduction to Systems Engineering”, John Wiley and Sons, New York. 2000.
- [47] H.A. Simon, “The New Science of Management Decision”, Englewood Cliffs, NJ: Prentice hall. 1977.
- [48] H. Simonsen, and J. Perry, “Risk Identification, Assessment and Management in the Mining and Metallurgical Industries”, *The Journal of the South African Institute of Mining and Metallurgy*, 1999, pp.321-331.
- [49] K. Smith, T.R. Mitchell, and C.E. Summer, “Top level management priorities in different stages of organizational life cycle”, *Academy of Management Journal*. 1985, 28(4): pp.799-820.
- [50] H.G. Sol, “Simulation in Information Systems Development”, PhD dissertation, University of Groningen, Groningen. 1982.
- [51] G. Ssebugwawo, “Supporting Micro Small Medium Enterprises (MSMEs) Trade Development as a Drive to Uganda’s Social and Economic Development, Traidlinks - Promoting Enterprise in the Developing World”, National Council of Uganda Small Business Organizations, 2007. pp.1-22.
- [52] J.K. Ssewanyana, “ICT Access and Poverty in Uganda”, *International Journal of Computing and ICT Research*, 2007, 1(2): pp.10-19.
- [53] J.K. Ssewanyana, and M. Busler, “Adoption and Usage of ICT in developing countries: Case of Ugandan Firms, *International Journal of Education and Development using Information and Communication Technology*, 2007, 3(3): pp.49-59.
- [54] J.D. Thompson, *Organizations in action*, MC Graw-Hill book Company, New York. 1967.
- [55] W.M.K. Trochim, P., James, and J.P. Donnelly, “Research Methods Knowledge Base”, Ohio: Thomson. 2007.
- [56] S.D.H. Tsai, and T. Lan, “Development of a Start-up Business – A Complexity Theory Perspective”, 2006. pp. 1-23.
- [57] UBOS, “Report on the Uganda Business Register 2006/2007”, Business Registry 2006/07- (UBOS and PSFU), 2007. pp. 1-144.
- [58] Uganda, Ministry of Finance, Planning and Economic Development (MFPED), “Millennium Development Goals Report for Uganda 2010”, Ministry of Finance, Planning and Economic Development, 2010. pp. 1-104.
- [59] UIA, “Small and Medium Enterprises (SME)”, Business Guide supported by Icelandic International Development Agency iceida, 2008, pp. 1-85.
- [60] T. Walter, P. Rosa, S. Barabas, W. Balunywa, A. Sserwanga, R. Namatovu, “Uganda 2004 GEM Report”, Kampala: Makerere University Business School, 2005.
- [61] Y. Wang, “A Studio Based Approach for Business Engineering and Mobile Services”, PhD thesis Delft University of technology, The Netherlands. 2007.
- [62] O.A. Wickham, “Strategic Entrepreneurship: A Decision-making Approach to New Venture Creation and Management”, 1st edition. Pitman Publishing, London. 2001.
- [63] O.E. Williamson, “The economic institutions of capitalism”. The free press, New York. 1985.
- [64] R. Winter, “Design Science Research in Europe”, *European Journal of Information Systems*, 2008, 17 (1): pp.470-475.
- [65] R.K. Yin, “Case Study Research Design and Methods”, Applied Social Research Methods - Sage publications Internationals Educational and professional Publisher – USA - 3rd Edition, 2003. 5(1): pp.1-94.