VALIDATED RISK IDENTIFICATION TOOL FOR ICT IN INTERNATIONAL DEVELOPMENT CO-OPERATION PROJECTS

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ABSTRACT

Literature shows that there are a number of different frameworks for managing international development co-operation (IDC) projects. Those frameworks have their own strengths and weaknesses and they vary from being highly abstract to relatively practical. However, none of the frameworks provide help in situations where IT professionals are incapable to identify potential project risks when entering a new project milieu. The situation is common in the context of IDC projects. For this purpose, Kemppainen et al. (2012) designed a taxonomy-based risk identification tool. The tool addresses potential risks by 55 quantified yes/no-questions. The quantification specifies the significance of each issue to project success. The tool is aimed at guiding IT professionals, planners, donors, field staff, and other stakeholders to identify and mitigate potential threats that may materialize in an unfamiliar project context. The tool's questions were designed based on the literature analysis, their classification into five groups was derived from Tedre et al. (2011), and their taxonomy based scoring was derived from the researchers' own data. Hence, the tool lacked wider empirical evidence. This study validated the tool based on empirical data of a sample of 83 IT experts and IT department leaders from a number of organizations, institutes, universities and international development co-operation projects in Tanzania. The mode value of the Likert-scale questionnaire answers were used to adjust the question-scoring scheme, and reliability analysis were conducted for testing internal consistency of the question groups' questions. Systematic reorganization of the questions with reliability analysis and content considerations led to three distinct question groups instead of the five original ones. In addition, two of the original questions were combined together due to their similarity. Hence, the validated risk identification tool contains three question groups, namely; Institutional, Societal, and Technical characteristics, including totally 54 quantified questions. Those three question groups determine the risk level of the prospective project.

KEYWORDS

Risk identification; ICT for development; ICT4D; ICT projects; International development cooperation.

1. INTRODUCTION

There are a number of frameworks for planning and managing international development co-operation (IDC) projects, e.g. Logical Framework Approach (LFA) and Result Based Management (RBM) (Team Technologies, 2005; Canadian International Development Agency, 2013; The Norwegian Agency for Development Cooperation, 1999). The frameworks have their own strengths and weaknesses, and they vary from highly abstract to

relatively practical. However, none of those frameworks help in situations where information technology (IT) professionals are incapable of identifying risk sources before entering the project milieu. That is a challenge because such situations are common in international development co-operation (IDC) projects (Kemppainen et al., 2012).

All IDC initiatives happen in a complex network of actors, and the success of those initiatives depends on an in-depth understanding of those actors, e.g. (Collier, 2007; Easterly, 2006; Sachs, 2005). In information and communication technology (ICT) projects, well-functioning technical solutions may fail due to poor understanding of the complete socio-technical system in the location of implementation (Tedre et al., 2011). Organizationally sound ideas may fail because of a poor socio-cultural understanding of the context of deployment (Easterly, 2006), and financially promising initiatives may fail as a result of a poor understanding of the economic characteristics of developing regions (Sachs, 2005).

The diversity of environments where technological solutions must work should be appreciated in ICT oriented IDC projects (Kamppuri, 2011). The projects' environmental, socio-cultural, and organizational aspects form a unique milieu for each project, and successful technology projects must recognize the unique characteristics of those milieus (Tedre, Kemppainen, & Ngumbuke, 2011). Hence, project's designers, planners, developers, collaborators, evaluators, and all other stakeholders need information on what works and what does not work in a certain context (Easterly, 2006; Smillie, 2000). Currently, ICT project success in IDC seems to depend more on tacit project elements, such as the experience of project leaders and staff, than systematic analysis of project milieu.

2. RISK IDENTIFICATION TOOL

To address the gap between tacit and explicit project elements, Kemppainen et al. (2012) designed a risk identification tool for ICT in IDC projects. The tool is aimed at assisting IT professionals and organizations to identify potential risk sources in ICT oriented IDC projects before they enter an unfamiliar project milieu. In addition, it assists to design appropriate countermeasures for overcoming identified risks before they materialize in the project implementation phase.

The risk identification tool uses a taxonomy-based risk identification process with 55 questions (Kemppainen et al., 2012). The questions were designed based on the literature analysis for addressing the issues that affect the realization of possible project risks. The structure of questions always requires a yes/no answer. The questions' grouping to the five groups called institutional, educational, socio-cultural, environmental, and technical characteristics was derived from Tedre et al. (2011).

The question-scoring scheme was designed based on researchers' own experiences in developing counties aiming at showing the significance of each addressed issue to the project success (Tedre et al., 2011). The scheme describes value of each addressed issue over two dimensions: generality of that issue and how directly that issue influences the work of project staff (Figure 1). Consequently, the question's scoring measures both the significance of each issue to project success, as well as the capacity of project staff to overcome challenges that may emerge. The tool's questions, the grouping, and the question-scoring scheme are presented in Annex 1 (Tables A.1-A.5).

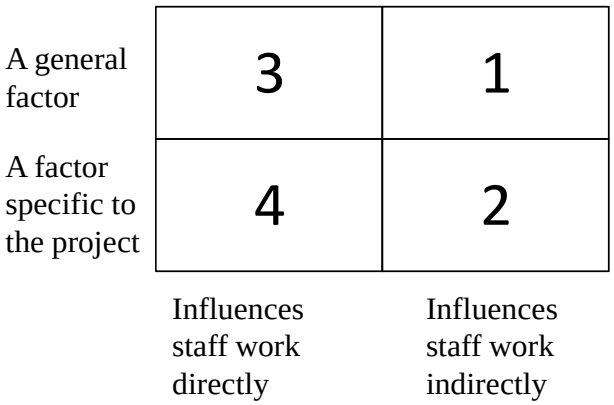


Figure 1. The scoring scheme for the questions

The risk identification tool estimates the project risk status by summarizing the questions' scores as Table 1 presents. The table consists of six rows: five rows are for the score of question groups and last row is for the project's total preparedness score. The columns present the names of question groups, project's actual preparedness scores, the maximum preparedness scores for each group, and risk categories for each question group. Project risk is high if its preparedness score is less than 50%, medium if its preparedness score is between 50% and 80% or low if its preparedness score is more than 80% of the group's maximum preparedness score.

Table 1. Project's risk status.

Question group	**Project Score**	**Maximum Score**	**High-risk**	**Medium-risk**	**Low-risk**
Institutional preparedness	(from Table A.1)	54	< 27	27 – 43	> 43
Educational preparedness	(from Table A.2)	25	< 13	13 - 20	> 20
Socio-cultural preparedness	(from Table A.3)	36	< 18	18 – 28	> 28
Environmental preparedness	(from Table A.4)	21	< 11	11 – 16	> 16
Technical preparedness	(from Table A.5)	38	< 19	19 – 30	> 30
Project's total score		174	< 87	87 - 139	> 139

3. RESEARCH METHOD

The overall objective of this study was to validate the risk identification tool of Kemppainen et al. (2012). Therefore, empirical data was collected for testing the reliability and validity of the tool's questions, the questions' grouping, and the question-scoring scheme. A questionnaire with a six point Likert-scale items was designed for the purpose (Annex 3). The questionnaire included questions on personal information of respondents, nature of the organization and duties, and their experiences within and other organizations they have worked before. Then the specific questions related to the tool followed. They were organized in subsets of institutional, educational, socio-cultural, environmental, and technical

characteristics of the project as they are grouped in the tool. The last question group of questionnaire, namely "Suitable ICT projects in developing economies (Tanzania)", was not connected to this study.

Data were collected from 30 organizations, institutes, universities, local government authorities (LGAs) and IDC projects in Iringa, Morogoro, Dar es Salaam and Arusha Regions in Tanzania. The organizations were purposively selected based on the nature of projects that were implemented. Although Spider-funded projects were the main target, we included other organizations such as ESRF (Economic and Social Research Foundation), REPOA (Research on Poverty Alleviation), LGAs, and other institutes and universities who are implementing various ICT-related projects funded by development co-operation partners. Universities were included because they implement various ICT oriented IDC projects. Those projects are funded by a number of development partners such as Swedish International Development Agency (SIDA), The Flemish Interuniversity Council (VLIR), Netherlands organisation for international cooperation in higher education (Nuffic), and Finnish Evangelical Lutheran Mission (FELM). From each organization up to three respondents were sought. Those respondents included IT leaders/managers and IT experts/technicians. The selection criteria were based on IT experience and training. In total a sample of 83 respondents was obtained who filled in the questionnaire.

First, the data were used to test whether each of the five question groups of the risk identification tool (institutional, educational, socio-cultural, environmental, and technical characteristics) were represented by a scale that is reliable in Tanzanian setting. For that analysis, the mode value of the answers was used due to the Likert-scale questionnaire. The mode values of answers were compared to the questions' scoring, and the scoring scheme was adjusted when appropriate.

Secondly, the data were used to analyze the validity of the questions. The most challenging aspect of the analysis was related to the data's sample size. The literature does not present clear guidance for sufficient sample size for factor analysis (Osborne & Costello, 2004), but the size between 50 and 400 is seen as minimum (Barrett & Kline, 1981; Aleamoni, 1976). In addition, Hair et al (2010) presented that examining the ratio of subjects to variables is as important as sample size. According to Hair et al. (2010), a sample size of 50 cases could be considered as minimum for analysis when the sample size is about five times more than the number of variables. In our case, there were 55 variables (total number of the questions, see Annex 1), and valid sample size should have had about 250 cases. However, getting such a number of IT professionals from ICT oriented IDC project in Tanzania was not feasible. Hence, we were not able to use Principal Component Analysis (PCA) for validating the questions in this study. Therefore, we analyzed the internal consistency of the question groups with SPSS's Reliability analysis by comparing then Cronbach's alpha coefficients of the questions'. Together with the results of that analysis, we considered the validity issue of questions, too.

4. RESULTS

The statistics about the respondents is summarized in Table 2. Although our sample was purposive based on IT training and experience, about 72% of all respondents were male. The situation is expected in Tanzania where males still dominate the science programs in education. In addition, the respondents were predominantly young IT experts (about 89% were below 40 years of age) with bachelor degree from universities. That fact indicates to the foreign experts the characteristics of the local experts when they work with them.

Table 2. Characteristics of the Respondents.

Age (years)	**Percent (n=83)**	**Education level**	**Per cent (n=83)**
21-30	42.2	O-level	3.6
31-40	47.0	A-level	4.8
41-50	8.4	Post-secondary education	4.8
51-60	2.4	University degree	68.7
		Post-graduate degree/diploma	18.1
Total	***100.0***	***Total***	***100.0***

IT Education/Training	**Per cent (n=83)**	**Gender**	**Per cent (n=83)**
Diploma	13.2	Male	72.3
Bachelor degree	68.7	Female	27.7
Post-graduate degree/diploma	18.1		
Total	***100.0***	***Total***	***100.0***

4.1 Question Scoring Scheme

Kemppainen et al. (2012) designed the question-scoring scheme of risk identification tool based on their own field experiences in developing countries. Even if those experiences are extensive (including 9000 pages of field records), it was important to test the scheme with empirical data from other sources. In this study, we used the mode value of the data for testing the question-scoring scheme. The mode values were used instead of average value due to used Likert scale (Stronly disagree, Disagree, Neutral, Agree, Strongly agree, Not applicable). It was considered that when mode value of the answers is Agree or Strongly Agree, Tanzanian IT professionals prioritize the question, otherwise they do not. Table 3 presents the questions-scoring in the original risk identification tools, the mode value of the answers, and proposed change to the scoring as the analysis shows. For example, the question INS1 has the score 3 in the original scheme and its mode value is Agree, and there is no need to change the priority score. Similarly, INS8 has the score 1 (low priority, see Figure 1) and its mode value is Agree (supports high priority), and the score is adjusted to 3 (high priority). The situation is opposite with INS11. It has the score 3 and the mode value Neutral, and the score is adjusted to 1.

Table 3. Adjusted Question Scoring Scheme.

SN	Current score	Mode	Proposed score
INS1	3	Agree	3
INS2	3	Agree	3
INS3	3	Agree	3
INS4	3	Agree	3
INS5	3	Agree	3
INS6	3	Agree	3
INS7	3	Agree	3
INS8	1	Agree	3
INS9	3	Agree	3
INS10	4	Agree	4
INS11	3	Neutral	1
INS12	3	Neutral	1
INS13	3	Neutral	1
INS14	4	Agree	4
INS15	4	Agree	4
INS16	4	Agree	4
INS17	4	Neutral	2
Total score	***54***		***48***

EDU1	1	Neutral	1
EDU2	3	Neutral	1
EDU3	4	Neutral	2
EDU4	3	Neutral	1
EDU5	4	Neutral	2
EDU6	3	Neutral	1
EDU7	4	Agree	4
EDU8	3	Neutral	1
Total score	***25***		***13***

SOC1	3	Agree	3

SN	Current score	Mode	Proposed score
ENV1	3	Neutral	1
ENV2	2	Agree	4
ENV3	3	Agree	3
ENV4	1	Neutral	1
ENV5	3	Agree	3
ENV6	3	Neutral	1
ENV7	3	Agree	3
ENV8	3	Neutral	1
Total score	***21***		***17***

TEC1	4	Agree	4
TEC2	4	Agree	4
TEC3	4	Neutral	2
TEC4	3	Agree	3
TEC5	4	Agree	4
TEC6	3	Agree	3
TEC7	1	Agree	3
TEC8	2	Agree	4
TEC9	2	Agree	4
TEC10	3	Agree	3
TEC11	4	Agree	4
TEC12	4	Agree	4
Total score	***38***		***42***

Grand total	**174**		**156**

SOC2	3	Agree	3
SOC3	2	Neutral	2
SOC4	4	Agree	4
SOC5	4	Agree	4
SOC6	4	Agree	4
SOC7	4	Agree	4
SOC8	4	Agree	4
SOC9	4	Agree	4
SOC10	4	Agree	4
Total score	***36***		***36***

Table 3 shows that Tanzanian IT professionals value 36 of the questions similarly as the authors of the risk identification tool did. Hence, there is no need to change the priorities of those questions. They proposed lower priority for 14 questions and higher priority for 5 questions compared to the original scoring. A number of the questions where the proposed priority is lower concerns issues of unfamiliar context for foreign professionals. Hence, their importance for risk realization may have been over-emphasized in the tool due to the authors' background as foreigners in developing countries. For example, INS11 (Has the local partner organization managed development funding before?) addresses a significant issue for a foreign professional due to possible challenges related to IDC project management. Still, its significance compared to other questions in the group does not support its high priority. When an institution has capacity to implement projects as the other questions address, the institution has capacity to adapt requirements of development funding donors, too. Similarly, ENV1 (Are statistics about climate conditions in the site available?) addresses a significant issue when a professional enters in a new project milieu. Still, a local professional is able to gain the information from other sources than statistics if they are involved in the project design. Four questions where the proposed priority is higher concern issues related to project implementation phase. For example, ENV2 (Is there regular and reliable transportation into and within the target area?) addresses very important issue when project implementation is considered in a context. Hence, its high priority is justified. The fifth question, INS8 (Is the project supported on the national level?), addresses a vital issue from IDC project donor's standpoint. Still, when its priority is compared to question INS9 (Is the project supported on the local level?), it is understandable that local support is prioritized over the national level in practical project situations.

The proposed adjustment to question-scoring scheme also changes the maximum score of the groups and the project risk status analysis. The effects of those changes are explained more specifically in the next section.

4.2 Reliability and Validity

SPSS's Reliability analysis was used to assess the questions' internal consistency *i.e.* to determine whether a given set of questions was measuring the same underlying construct. Principally, there are as many factors or subsets as the number of variables entered. It is then up to the researchers to decide the number of subsets based on conceptual foundation with

some empirical evidence *i.e*. the number of factors that can reasonably be supported (Hair et al., 2010). In the case of risk identification tool, there were five subsets or groups for the analysis. In addition, *not applicable* –answers were seen as *neutral* –answers in this analysis. The *neutral* –answer was chosen as replacement because the *not applicable* -answers seemed to correlate more with the respondent's position in the project organization and their IT expertise than the reliability of questions as such.

The preliminary analysis of the groups guided us to do a major reorganization of the questions because quite a number of questions did not fit well into their respective group. The preliminary results indicated that instead of five groups, less are required. Finally, after a number of re-grouping of questions based on "scale if item deleted"-option of Cronbach's alpha coefficient, the questions were organized under three groups, namely institutional, societal, and technical characteristics. The solution after re-grouping of the questions and validity analysis is presented in Table 4.

Table 4. Original Question Groups and the Result after the Analysis.

Question group	**Number of questions**	**Cronbach's alpha**	**Questions in group**
Original:			
Institutional characteristics	17	0.586	INS 1-17
Educational characteristics	8	0.572	EDU 1-8
Socio-cultural characteristics	10	0.413	SOC 1-10
Environmental characteristics	8	0.348	ENV 1-8
Technical characteristics	12	0.559	TEC 1-12
Result:			
Institutional characteristics	24	0.674	INS 1-7, 11, 13-17 EDU 4-8 SOC 10 ENV 5-8 TEC 11
Societal characteristics	13	0.664	INS 8-10, 12 EDU 1-3 SOC 1-3, 9 ENV 1,2(,3)
Technical characteristics	17	0.590	TEC 1-10,12 ENV 4 SOC 4-8

As Table 4 shows, four questions from educational characteristics group, namely EDU4 (Have sufficient resources been allocated for preparing local staff for the investors'/donors' project practices?), EDU5 (Will the project pay locally appropriate salaries to local staff?), EDU6 (There are incentives set for minimizing the risk of brain drain during the project), and EDU8 (Is/are the local partner organization(s) prepared to provide necessary security measures for the project?), were moved into the institutional characteristics group. This is a reasonable change because those kind of incentives typically depend on institutional resources or preparedness rather than educational characteristics of staff. Similarly, the questions SOC 10, ENV4, ENV5, ENV6, ENV7, ENV8, and TEC 11 (Annex 1) address issues that depend on institution's capacity to implement IDC projects.

Four questions from institutional characteristics group, namely INS8 (Is the project supported on the national level?), INS9 (Is the project supported on the local level?), INS10 (Is the project goal(s) supported in the local community?), and INS12 (Are there commercial banks operating normally in the project area?), were moved into the societal characteristics group. Those kind of issues are typically a part of wider context and not only depend on an institution's own actions. In addition, the questions EDU1, EDU2, EDU3, ENV1, ENV2, and ENV3 (Annex 1) were moved into societal characteristics group because they address wider issues than just institution's capacity or the project's technical foundation.

Four questions from socio-cultural characteristics group, namely SOC4 (Is the project manual practical?), SOC5 (Are the instructions for financial management practical?), SOC6 (Is the procurement policy practical?), SOC7 (Is the staff policy clear and unambiguous?), and SOC8 (Is the project plan flexible?), were moved into the technical characteristics group. Those questions address issues related to project technical implementation, and the respondents considered them as technical characteristics, not socio-cultural as the tool's designers assumed. Similarly, ENV5 (Are relevant environmental issues acknowledged in the country and by the project?) was moved into the technical characteristics group.

The literature presents that the reliability of questionnaire questions is on acceptable level when the value of Cronbach's alpha coefficient is higher than 0.7 (Pallant, 2013; Hair Jr.;Black;Balbin;& Anderson, 2010). In our case, the alpha is 0,760 when the whole questionnaire is analyzed without grouping. Hence, the analysis shows that questions probably measure the same construct. In addition, Hair Jr. et al. (2010) argued that although Cronbach's alpha of 0.7 or above is desirable, a coefficient of 0.6 is acceptable in exploratory research. Table 4 shows that the alpha was greater than 0.6 in institutional and societal characteristics groups, and less in technical characteristics group.

The re-grouping of questions forced us to consider the validity of the questions, too. The reliability analysis showed that the technical characteristics group would have gained the alpha 0.617 without the question SOC6 (Is the procurement policy practical?). In addition, SOC6 would have fit well into the institutional characteristics group when the alpha coefficient is compared only. Still, in spite of the result of reliability analysis, that move was not implemented due to the question's close relationship to other questions in the technical characteristics group. In addition, we did not want to remove it from the questionnaire due to the issue's importance for project timetable during the project implementation phase.

The internal validity of the question groups was analyzed by considering the questions' similarity in the groups. The analysis led us to combine two questions in the societal characteristics group together. The questions ENV2 (Is there regular and reliable transportation into and within the target area?) and ENV3 (Is target area reachable around the year?) were re-designed as "Is target area reachable around the year? (*For example, roads are*

passable during rainy season or regular flights, trains, buses, or taxes operate in target area or between the site and a major city in the area)". The new question earned the priority score 4 because the issue influences directly staff work, and it is a project specific factor (Figure 1).

The new question grouping and question-scoring scheme for risk identification tool is presented in Annex 2 (Tables A.6-A.8). In addition, The re-grouping of question changed the taxonomy scales of the project risk status, too (Table A.9).

5. CONCLUSIONS

This paper validated the risk identification tool of Kemppainen et al. (2012) for ICT in international development co-operation projects. The original 55 questions of the tool were designed based on the literature analysis, five question groups were derived from Tedre et al (2011), and the questions' taxonomy based scoring was designed by analyzing the researchers own data from developing countries. Therefore, the tool lacked wider empirical evidence.

The empirical data was collected for validating the tool from 30 organizations, institutes, universities and IDC projects in Tanzania. A questionnaire with a six point Likert-scale items was designed for the purpose (Annex 3). The validation was a challenge because the sample size of 83 was too small compared to existent 55 variables for factor analysis. Hence, the tool's question-scoring scheme was adjusted using the mode values of answers and SPSS's reliability analysis was conducted for analyzing the internal consistency of the questions groups. As a result, the questions were re-organized into three groups, namely institutional, societal, and technical characteristics. Finally, the questions validity was considered, and two of the original questions were combined together due to their similarity.

The validated risk identification tool includes 54 questions in three risk categories namely, institutional, societal, and technical characteristics for determining the risk level of the prospective project (Annex 2). The estimated taxonomy based risk level (high, medium, or low) may affect the overall project performance when IT professionals are entering an unfamiliar project milieu. The lack of factor analysis may hinder the results' reliability, and more profound study is recommended for confirming the results. Currently, that kind of sample size is possible if the study address a number of developing countries instead of just one, as it was case in this study.

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ANNEX 1. RISK IDENTIFICATION TOOL

Table A.1. Institutional Characteristics.

SN	Item statement	Yes	No
Organizational Preparedness for Development Project:			
INS1	Is a project manual available?	3	0
INS2	Is a financial management policy is available?	3	0
INS3	Is a procurement policy is available?	3	0
INS4	Is an anti-corruption policy is available?	3	0
INS5	Is a staff policy is available?	3	0
INS6	Is a fixed asset policy is available?	3	0
INS7	Are there mechanisms for monitoring and/or evaluation? (For example, planning, monitoring, and evaluation mechanisms are defined and utilized according to organization's long-term goals/plans/programs, and the project has precise objectives with success indicators)	3	0
Ownership and Environment:			
INS8	Is the project supported on the national level? (For example, the project is in line with national strategies for development, or the project has a high-level patron on the national level such as a minister or a member of parliament)	1	0
INS9	Is the project supported on the local level? (For example, the project is in line with local priority areas for development, or the project has a high-level patron on the local level, such as a high-ranking regional officer)	3	0
INS10	Is the project goal(s) supported in the local community? (For example, the project started on the local initiative, or the planning is based on a participatory approach)	4	0
INS11	Has the local partner organization managed development funding before?	3	0
INS12	Are there commercial banks operating normally in the project area? (For example, it is possible to open a separate bank account for the project, and it is possible to use credit cards for purchases)	3	0
INS13	Is there a support mechanism for helping with investors'/donors' bureaucracy?	3	0
Staffing:			
INS14	Does the project have a responsible project manager? (Full-time or part-time but there are a formalized position and an allocated budget)	4	0
INS15	Does the project have sufficient financial staff? (For example, an accountant is appointed to the project organization)	4	0
INS16	Are there expert(s) appointed for consultation on immigration and labor laws?	4	0

INS17	Are there expert(s) appointed for procurement?	4	0
Maximum score for institutional preparedness is 54 points			

Table A.2. Educational Characteristics.

SN	Item statement	Yes	No
Foreign Staff Preparedness:			
EDU1	Have foreign employees been educated in development studies (or related)?	1	0
EDU2	Do foreign employees have a basic understanding about the local culture? (For example, they have participated in orientation training)	3	0
EDU3	Are foreign employees able to communicate in the local de facto language? (Sometimes the official language might not be the common working language)	4	0
Local Staff Expertise:			
EDU4	Have sufficient resources been allocated for preparing local staff for the investors'/donors' project practices?	3	0
EDU5	Will the project pay locally appropriate salaries to local staff? (The local salary structure is recognized in the project)	4	0
EDU6	Are there any incentives set for minimizing the risk of brain drain during the project?	3	0
Security Measures:			
EDU7	Do foreign employees have a basic understanding about the necessary security measures in their new environment?	4	0
EDU8	Is (are) the local partner organization(s) prepared to provide necessary security measures for the project? (For example, project site's physical security is properly organized and issues such as site's security fence, and 24/7 guarding are exist)	3	0
Maximum score for the educational preparedness is 25 points			

Table A.3. Socio-cultural Characteristics.

SN	Item statement	Yes	No
Staff Members' Practical Preparedness to Multicultural Work:			
SOC1	Do the foreign staff members have experience working in multicultural teams?	3	0
SOC2	Do the local staff members have experience working in multicultural teams?	3	0
SOC3	Are the foreign staff members educated on development work? (For example, training course for development workers is a part of the project staff` orientation period)	2	0
Adequacy of Project Management Procedures to Project Milieu:			
SOC4	Is the project manual practical? (For example, the manual has clear advice and templates for work plans, narrative reports, financial reports, etc)	4	0
SOC5	Are the instructions for financial management practical? (For example, there is a written policy for staff concerning authorization of expenditure)	4	0
SOC6	Is the procurement policy practical? (For example, the policy defines procedures for inquiring quotations and selecting suppliers)	4	0
SOC7	Is the staff policy clear and unambiguous? (For example, every job description includes clear statements of the job's responsibilities)	4	0
SOC8	Is the fixed-asset policy practical? (For example, the policy defines the use of vehicle's logbook, a format for the fixed-asset register, and people responsible for keeping such things up to date)	4	0
SOC9	Is the project plan flexible? (For example, if an unexpected internal or external event changes the project environment, the project plan can be adjusted accordingly)	4	0
SOC10	Is the foreign experts' role in the project organization a support role instead of a leading role? (Note! The answer should be "yes" if a foreign leader has lived in the context a number of years)	4	0
Maximum score for the socio-cultural preparedness is 36 points			

Table A.4. Environmental Characteristics.

SN	Item statement	Yes	No
Project's Preparedness to Face Environmental Issues:			
ENV1	Are statistics about climate conditions in the site available? (For example, rainfall, snowfall, humidity, and maximum and minimum temperatures)	3	0
ENV2	Is there regular and reliable transportation into and within the target area? (For example, regular flights, trains, buses, or taxes operate in target area or between the site and a major city in the area)	2	0
ENV3	Is target area reachable around the year? (For example, roads are passable during rainy season too)	3	0
ENV4	Are relevant environmental issues acknowledged in the country and by the project? (For example, waste management is organized, and used batteries are recycled. Project documentation includes environmental impact assessment if necessary)	1	0
Staff Preparedness for Health Concerns:			
ENV5	Are the staff members informed about the necessary insurances concerning medical treatments? (For example, employer's responsibilities concerning health issues are defined precisely)	3	0
ENV6	Are the staff members informed about the necessary vaccinations, health risks, and prophylactic medication? (For example, what kind of antimalarial medication is recommended)	3	0
ENV7	Are the staff members informed about preventive health care practices in the project area? (For example, how to process safe drinking water)	3	0
ENV8	Are the staff members informed about the available and reliable acute care units, and about the local procedures concerning health services?	3	0
Maximum score for the environmental preparedness is 21 points			

Table A.5. Technical Characteristics.

SN	Item statement	Yes	No
Preventive Measures:			
TEC1	Are up-to-date drawings of site buildings available?	4	0
TEC2	Are up-to-date electrical diagrams of site buildings available?	4	0
TEC3	Are statistics about the quality of electricity in the site area available OR is the project prepared for significant power problems?	4	0
TEC4	Does the site have a power source? (For example, the site is connected to the national power grid or it has a well-maintained power source such as local diesel generator or solar power system)	3	0
Local maintenance Preparedness:			
TEC5	Has a local IT expert been involved in the project design?	4	0
TEC6	Are there more than one local IT companies present in the project area?	3	0
TEC7	Are there more than one local Internet service providers available?	1	0
TEC8	Can ICT equipment be bought locally?	2	0
TEC9	Are the necessary tools and accessories available locally? (For example, cabinets, cable chutes etc.)	2	0
TEC10	Does the local partner organization have permanent IT staff for IT service Management? (For example, IT support and maintenance is organized in the project site, and IT staff is permanently located there)	3	0
TEC11	Are procurement staff members experienced with bidding invitations for ICT equipment?	4	0
TEC12	Are the crucial parts of ICT infrastructure maintainable locally? (For example, a Linux expert and an electrician are working for the organization, or their services can be contracted locally)	4	0
Maximum score for the technical preparedness is 38 points			

ANNEX 2. VALIDATED RISK IDENTIFICATION TOOL

Table A.6. Institutional Characteristics.

SN	Item statement	Yes	No
Organizational Preparedness for Development Project:			
1.1	Is a project manual available?	3	0
1.2	Is a financial management policy is available?	3	0
1.3	Is a procurement policy is available?	3	0
1.4	Is an anti-corruption policy is available?	3	0
1.5	Is a staff policy is available?	3	0
1.6	Is a fixed asset policy is available?	3	0
1.7	Are there mechanisms for monitoring and/or evaluation? (For example, planning, monitoring, and evaluation mechanisms are defined and utilized according to organization's long-term goals/plans/programs, and the project has precise objectives with success indicators)	3	0
1.8	Does the local partner organization have managed development funding before?	1	0
1.9	Is there a support mechanism for helping with investors'/donors' bureaucracy?	1	0
1.10	Are there any incentives set for minimizing the risk of brain drain during the project?	1	0
Staffing:			
1.11	Does the project have a responsible project manager? (Full-time or part-time but there are a formalized position and an allocated budget)	4	0
1.12	Does the project have sufficient financial staff? (For example, an accountant is appointed to the project organization)	4	0
1.13	Are there expert(s) appointed for consultation on immigration and labor laws?	4	0
1.14	Are there expert(s) appointed for procurement?	2	0
1.15	Are procurement staff members experienced with bidding invitations for ICT equipment?	4	0
1.16	Have sufficient resources been allocated for preparing local staff for the investors'/donors' project practices?	1	0
1.17	Will the project pay locally appropriate salaries to local staff? (The local salary structure is recognized in the project)	2	0
1.18	Is the foreign experts' role in the project organization a support role instead of a leading role? (Note! The answer should be "yes" if a foreign leader has lived in the context a number of years)	4	0

Security and medical preparedness:			
1.19	Do foreign employees have a basic understanding about the necessary security measures in their new environment?	4	0
1.20	Is (are) the local partner organization(s) prepared to provide necessary security measures for the project? (For example, project site's physical security is properly organized and issues such as site's security fence, and 24/7 guarding are exist)	1	0
1.21	Are the staff members informed about the necessary insurances concerning medical treatments? (For example, employer's responsibilities concerning health issues are defined precisely)	3	0
1.22	Are the staff members informed about the necessary vaccinations, health risks, and prophylactic medication? (For example, what kind of antimalarial medication is recommended)	1	0
1.23	Are the staff members informed about preventive health care practices in the project area? (For example, how to process safe drinking water)	3	0
1.24	Are the staff members informed about the available and reliable acute care units, and about the local procedures concerning health services?	1	0
	Maximum score for the institutional preparedness is 62 points		

Table A.7. Societal Characteristics.

SN	Item statement	Yes	No
Project Ownership:			
2.1	Is the project supported on the national level? (For example, the project is in line with national strategies for development, or the project has a high-level patron on the national level such as a minister or a member of parliament)	3	0
2.2	Is the project supported on the local level? (For example, the project is in line with local priority areas for development, or the project has a high-level patron on the local level, such as a high-ranking regional officer)	3	0
2.3	Is the project goal(s) supported in the local community? (For example, the project started on the local initiative, or the planning is based on a participatory approach)	4	0
2.4	Is the project plan flexible? (For example, if an unexpected internal or external event changes the project environment, the project plan can be adjusted accordingly)	4	0
Staff Preparedness to Multicultural Work:			
2.5	Have foreign employees been educated in development studies (or related)?	1	0
2.6	Do foreign employees have a basic understanding about the local culture? (For example, they have participated in orientation training)	1	0
2.7	Are foreign employees able to communicate in the local de facto language?	2	0

	(Sometimes the official language might not be the common working language)		
2.8	Do the foreign staff members have experience working in multicultural teams?	3	0
2.9	Do the local staff members have experience working in multicultural teams?	3	0
2.10	Are the foreign staff members educated in development work? (For example, training course for development workers is a part of the project staff` orientation period)	2	0
Project Milieu:			
2.11	Are there commercial banks operating normally in the project area? (For example, it is possible to open a separate bank account for the project, and it is possible to use credit cards for purchases)	1	0
2.12	Are statistics about climate conditions in the site available? (For example, rainfall, snowfall, humidity, and maximum and minimum temperatures)	1	0
2.13	Is target area reachable around the year? (For example, roads are passable during rainy season or regular flights, trains, buses, or taxes operate in target area or between the site and a major city in the area)	4	0
Maximum score for the socio-cultural preparedness is 32 points			

Table A.8. Technical Characteristics.

SN	Item statement	Yes	No
Preventive Measures:			
3.1	Are up-to-date drawings of site buildings available?	4	0
3.2	Are up-to-date electrical diagrams of site buildings available?	4	0
3.3	Are statistics about the quality of electricity in the site area available OR is the project prepared for significant power problems?	2	0
3.4	Does the site have a power source? (For example, the site is connected to the national power grid or it has a well-maintained power source such as local diesel generator or solar power system)	3	0
Local maintenance Preparedness:			
3.5	Has a local IT expert been involved in the project design?	4	0
3.6	Are there more than one local IT companies present in the project area?	3	0
3.7	Are there more than one local Internet service providers available?	3	0
3.8	Can ICT equipment be bought locally?	4	0
3.9	Are the necessary tools and accessories available locally? (For example,	4	0

	cabinets, cable chutes etc.)		
3.10	Does the local partner organization have permanent IT staff for IT service Management? (For example, IT support and maintenance is organized in the project site, and IT staff is permanently located there)	3	0
3.11	Are the crucial parts of ICT infrastructure maintainable locally? (For example, a Linux expert and an electrician are working for the organization, or their services can be contracted locally)	4	0
Adequacy of Project Management Procedures to Project Milieu:			
3.12	Is the project manual practical? (For example, the manual has clear advice and templates for work plans, narrative reports, financial reports, etc)	4	0
3.13	Are the instructions for financial management practical? (For example, there is a written policy for staff concerning authorization of expenditure)	4	0
3.14	Is the procurement policy practical? (For example, the policy defines procedures for inquiring quotations and selecting suppliers)	4	0
3.15	Is the staff policy clear and unambiguous? (For example, every job description includes clear statements of the job's responsibilities)	4	0
3.16	Is the fixed-asset policy practical? (For example, the policy defines the use of vehicle's logbook, a format for the fixed-asset register, and people responsible for keeping such things up to date)	4	0
3.17	Are relevant environmental issues acknowledged in the country and by the project? (For example, waste management is organized, and used batteries are recycled. Project documentation includes environmental impact assessment if necessary)	1	0
Maximum score for the technical preparedness is 59 points			

Table A.9. Project's Risk Status.

Question group	**Project Score**	**Maximum Score**	**High-risk**	**Medium-risk**	**Low-risk**
Institutional characteristics		62	< 31	31 – 49	> 49
Socio-cultural characteristics		32	< 16	16 –25	> 25
Technical characteristics		59	< 29	29 – 47	> 47
Project's Total Score		153	< 76	76 - 122	> 122

ANNEX 3. THE QUESTIONNAIRE

EMPERICALLY GROUNDED RISK ASSESSMENT FRAMEWORK FOR ICT-RELATED DEVELOPMENT PROJECTS

Dear Respondent,

Thank you for your interest in this study.

This research project collect data from ICT professionals in a number of development projects where ICT is involved. It identifies common risks and trouble spots in them, and builds a risk identification framework, which is aimed at assisting IT professionals and organisations to identify sources of challenges in ICT-related international cooperation projects, and to design appropriate countermeasures for overcoming risks before the project enters the implementation phase. Our framework is aimed at guiding planners, donours, field staff and other stakeholders to identify and mitigate possible threats from an unfamiliar project context in ICT-related international development cooperation. We collect data from international projects undertaken by development organisations, government and universities in Tanzania.

Your participation in this study is voluntary. You may choose to skip some of the questions, and to quit participation at any stage. Your answer is anonymous. By returning the filled in questionnaire you agree that the collected data can be used for scientific research. Only the researchers of this study have access to the answer sheets. Kindly, please, return the questionnaire to our enumerator as soon as you complete. Researchers of the study are Dr. Bukaza Chachage and Dr. Hosea Mpogole (University of Iringa), Mr. Jyri Kempainen (University of Eastern Finland) and Prof. Matti Tedre (Stockholm University). Thank you.

A) Personal Information

A1. Name (optional): ……..

A2. Phone number (optional): …….....

A3. Age: ……....

A4. Gender: ……..

A5. Basic training (e.g. O-level, A-level): ……

A6. IT Education (e.g. Diploma, Degree): ……

A7. IT experience before current position: ……..

B) Organisation and Duties

Name of the organisation/University: ……

Position: ……

Years in current position: …….

Number of IT subordinates: ……..

Main duties: ……..

In the following sections, kindly circle or tick as appropriate: SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree, and NA = not applicable.

	SD	D	N	A	SA	NA
C. Institution characteristics						
C1. There is project manual to guide our operations (May opt for YES/NO answer)	SD	D	N	A	SA	NA
C2. The financial management policy is available (May opt for YES/NO answer)	SD	D	N	A	SA	NA
C3. The procurement policy is available (May opt for YES/NO answer)	SD	D	N	A	SA	NA
C4. The anti-corruption policy is available (May opt for YES/NO answer)	SD	D	N	A	SA	NA
C5. The staff policy is available (May opt for YES/NO answer)	SD	D	N	A	SA	NA
C6. The fixed asset policy is available (May opt for YES/NO answer)	SD	D	N	A	SA	NA
C7. There are mechanisms for monitoring and/or evaluation (For example, planning, monitoring, and evaluation mechanisms are defined and utilized according to organization's long-term goals/plans/programs, and the project has precise objectives with success indicators)	SD	D	N	A	SA	NA
C8. The project is supported on the national level (For example, the project is in line with national strategies for development, or the project has a highlevel patron on the national level such as a minister or a member of parliament)	SD	D	N	A	SA	NA
C9. The project is supported on the local level (For example, the project is in line with local priority areas for development, or the project has a highlevel patron on the local level, such as a high-ranking regional officer)	SD	D	N	A	SA	NA
C10. The project goal(s) is supported in the local community (For example, the project started on the local initiative, or the planning is based on a participatory approach)	SD	D	N	A	SA	NA
C11. The local partner organization has managed development funding before	SD	D	N	A	SA	NA
C12. The commercial banks are operating normally in the project area (For example, it is possible to open a separate bank account for the project, and it is possible to use credit cards for purchases)	SD	D	N	A	SA	NA
C13. There is support mechanism for helping with investors'/donors' bureaucracy	SD	D	N	A	SA	NA
C14. The project have a responsible project manager (Full-time or parttime but there are a formalized position and an	SD	D	N	A	SA	NA

allocated budget)						
C15. The project has sufficient financial staff (For example, an accountant is appointed to the project organization)	SD	D	N	A	SA	NA
C16. The expert(s) are appointed for consultation on immigration and labor laws	SD	D	N	A	SA	NA
C17. The expert(s) is appointed for procurement	SD	D	N	A	SA	NA
D. Education characteristics						
D1. Foreign employees have been educated in development studies (or related)	SD	D	N	A	SA	NA
D2. Foreign employees have a basic understanding about the local culture(For example, they have participated in orientation training)	SD	D	N	A	SA	NA
D3. Foreign employees are able to communicate in the local de facto language (Sometimes the official language might not be the common working language)	SD	D	N	A	SA	NA
D4. Sufficient resources have been allocated for preparing local staff for the investors'/donors' project practices	SD	D	N	A	SA	NA
D5. The project pay locally appropriate salaries to local staff (The local salary structure is recognized in the project)	SD	D	N	A	SA	NA
D6. There are incentives set for minimizing the risk of brain drain during the project	SD	D	N	A	SA	NA
D7. Foreign employees have a basic understanding about the necessary security measures in their new environment	SD	D	N	A	SA	NA
D8. There are local partner organization(s) prepared to provide necessary security measures for the project (For example, project site's physical security is properly organized and issues such as site's security fence, and 24/7 guarding are exist)	SD	D	N	A	SA	NA
E. Social cultural characteristics						
E1. The foreign staff members have experience working in multicultural teams	SD	D	N	A	SA	NA
E2. The local staff members have experience working in multicultural teams	SD	D	N	A	SA	NA
E3. The foreign staff members are educated on development work (For example, training course for development workers is a part of the project staff` orientation period)	SD	D	N	A	SA	NA
E4. The project manual is practical (For example, the manual has clear advice and templates for work	SD	D	N	A	SA	NA

plans, narrative reports, financial reports, etc)						
E5. The instructions for financial management is practical (For example, there is a written policy for staff concerning authorization of expenditure)	SD	D	N	A	SA	NA
E6. The procurement policy is practical (For example, the policy defines procedures for inquiring quotations and selecting suppliers)	SD	D	N	A	SA	NA
E7. The staff policy is clear and unambiguous (For example, every job description includes clear statements of the job's responsibilities)	SD	D	N	A	SA	NA
E8. The fixed-asset policy is practical (For example, the policy defines the use of vehicle's logbook, a format for the fixed-asset register, and people responsible for keeping such things up to date)	SD	D	N	A	SA	NA
E9. The project plan is flexible (For example, if an unexpected internal or external event changes the project environment, the project plan can be adjusted accordingly)	SD	D	N	A	SA	NA
E10. The foreign experts' role in the project organization a support role instead of a leading role (Note! The answer should be "yes" if a foreign leader has lived in the context a number of years)	SD	D	N	A	SA	NA
F. Environmental Characteristics						
F1. The statistics about climate conditions in the site are available (For example, rainfall, snowfall, humidity, and maximum and minimum temperatures)	SD	D	N	A	SA	NA
F2. There is regular and reliable transportation into and within the target area (For example, regular flights, trains, buses, or taxes operate in target area or between the site and a major city in the area)	SD	D	N	A	SA	NA
F3. The target area is reachable around the year (For example, roads are passable during rainy season too)	SD	D	N	A	SA	NA
F4. The relevant environmental issues are acknowledged in the country and by the project (For example, waste management is organized, and used batteries are recycled. Project documentation includes environmental impact assessment if necessary)	SD	D	N	A	SA	NA
F5. The staff members are informed about the necessary insurances concerning medical treatments (For example, employer's responsibilities concerning health issues are defined precisely)	SD	D	N	A	SA	NA
F6. The staff members are informed about the necessary vaccinations, health risks, and prophylactic medication (For example, what kind of antimalarial medication is recommended)	SD	D	N	A	SA	NA

F7. The staff members are informed about preventive health care practices in the project area (For example, how to process safe drinking water)	SD	D	N	A	SA	NA
F8. The staff members are informed about the available and reliable acute care units, and about the local procedures concerning health services	SD	D	N	A	SA	NA
G. Technical Characteristics						
G1. The up-to-date drawings of site buildings are available	SD	D	N	A	SA	NA
G2. The up-to-date electrical diagrams of site buildings are available	SD	D	N	A	SA	NA
G3. The statistics about the quality of electricity in the site area are available OR is the project prepared for significant power problems	SD	D	N	A	SA	NA
G4. The site have a power source (For example, the site is connected to the national power grid or it has a well-maintained power source such as local diesel generator or solar power system)	SD	D	N	A	SA	NA
G5. A local IT expert has been involved in the project design	SD	D	N	A	SA	NA
G6. There are more than one local IT companies present in the project area	SD	D	N	A	SA	NA
G7. There are more than one local Internet service providers available	SD	D	N	A	SA	NA
G8. ICT equipment can be bought locally	SD	D	N	A	SA	NA
G9. The necessary tools and accessories are available locally (For example, cabinets, cable chutes etc.)	SD	D	N	A	SA	NA
G10. The local partner organization have permanent IT staff for IT service management (For example, IT support and maintenance is organized in the project site, and IT staff is permanently located there)	SD	D	N	A	SA	NA
G11. The procurement staff members are experienced with bidding invitations for ICT equipment	SD	D	N	A	SA	NA
G12. The crucial parts of ICT infrastructure are maintainable locally (For example, a Linux expert and an electrician are working for the organization, or their services can be contracted locally)	SD	D	N	A	SA	NA
H. Suitable ICT projects in developing economies (Tanzania)						
H1. Management is supportive to the foreigners attached to the ICT Unit	SD	D	N	A	SA	NA
H2. Procedureas and policies concerning foreigners working to the ICT unit are available and clear	SD	D	N	A	SA	NA

H3. Availability of ICT facilities is supportive to the foreigners working to the ICT unit	SD	D	N	A	SA	NA
H4. There is cultural orientation for the foregners working in the ICT unit	SD	D	N	A	SA	NA
H5. There is dedicated unit dealing with matters concerning foreigners working for the unit	SD	D	N	A	SA	NA
H6. Processes are defined to empower local staff to take over when foreigners leave	SD	D	N	A	SA	NA
H7. There is honesty relationship between local staff and foreigners	SD	D	N	A	SA	NA
H8. Financial systems are supportive for development of the unit	SD	D	N	A	SA	NA
H9. Support services are available for foreigners to work at the unit	SD	D	N	A	SA	NA

Thanking you again for participating in this study.