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Evaluation of Livestock Information Network Knowledge System (LINKS) based on User Satisfaction

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ABSTRACT

The advancement of technology has brought low cost mobile phones which are affordable to majority of livestock keepers and traders in Kilosa District. The Government of Tanzania has developed livestock market information system which offers markets and market information for different livestock products. The system was established to enhance the bargaining power of livestock keepers to traders and middlemen in livestock markets. Thus the ultimate goal of the developed system was to create a platform to link farmers and lenders, as well as farmers and buyers. Despite the potential of the developed system, few livestock keepers are using it. This study was designed to evaluate the usability of the livestock market information system as well as the causes of its limited use. The Software Usability Measurement Inventory approach for usability was used during system evaluation to gauge user's satisfaction. The results indicate that development of the livestock market information system was not participatory enough. The majority of respondents indicated that the mapping of information needs was inadequate and therefore, information contents provided by the system do not meet user requirements. The results indicate the need to adopt user centred systems development involving all stakeholders in all phases of software development life cycle. Hence there is a need to improve up to date publication of market information to enable users to get reliable prices via web and mobile phones.

Keywords: *livestock, market, information system, user satisfaction, SUMI*

1. INTRODUCTION

The demand for qualitative and reliable softwares, conforming to international standards and easy to integrate into existing system structures is continuously growing.The cost of software production and software maintenance is rising dramatically, as a consequence of the increasing complexity and the need for better designed and user friendly software products. In that regard,evaluation of software performance is of paramount importance to ensure that it satisfies users' requirements (Stamelos etal, 2000). According to Freeman (2006), evaluation refers to a periodic process of gathering data and then analyzing it in such a way that the resulting information can be used to determine whether your organization or program is effectively carrying out planned activities. An evaluation can also illustrate the extent to which your organization or program is achieving its stated objectives and anticipated results.

Two main areas are distinguished within software quality evaluation. These are process evaluation and product evaluation. Processevaluation analyses the software development process and highlights areas for improvement. Product evaluation addresses the fit between customer's needs and the suppliers' promises about the product, often referred to as software product quality (Punter and Lami, 1998).

Livestock Information Network and Knowledge System (LINKS) is a web based information system developed to establish a livestock marketing database for planning, research and monitoring of marketing trends. The system provides near real time livestock market information which is available on request via short text message system (SMS), email, WorldSpace radio systems and on the internet. LINKS provides regular livestock prices and volume information on most of the major livestock market in Tanzania. The information is availed to all players in livestock marketing such as livestock producers, traders, government and non-government organizations to assist them in decision making (CNRIT, 2011).

Research has shown that livestock marketing information plays a significant role in improving the performance of pastoral production and marketing systems (Ndikumana et al. 2000; Aklilu et al. 2002; Mbogoh et al. 2005). More timely, accurate and reliable livestock information can lead to increased commercial livestock off take and increased producer prices.

It is argued that traders and middlemen have a competitive advantage over producers in negotiating for prices, because the former have access to prices in both primary and terminal markets, while the latter only have limited access to prices in the primary markets (Komen et al, 2009). LINKS was developed to assist livestock producers to have easy access of marketing information especially the price of livestock in major markets across the country. Experience has shown that lack of information targeting is one of the major challenges facing LINKS. Although there solid evidence exist, it has been suggested thatmost of livestock producers, the LINKS proclaim to assist, find the information provided among other issues neither accurate nor useful.

Therefore, this study aimed at conducting a formal software evaluation on LINKS to study the users satisfaction level. Certainly, results from this study will provide important baseline data to developers of livestock marketing information systems. Furthermore data generatedwill facilitate development of effective and efficient livestock market information systems, i.e systems that are capable of transmitting relevant, accurate, reliable, accessible and useful information to all stakeholders of livestock marketing for wider adoption by targeted groups and realize their benefits.

2. SYSTEM EVALUATION

Definition of Information System evaluation

As defined by the American Evaluation Association (2010), evaluation involves assessing the strengths and weaknesses of programs, policies, personnel, products, and organizations to improve their effectiveness. Trochim (2006) defined evaluation as the systematic assessment of the worth or merit of some objects.Willcocks (1992) defined information system evaluation as the process of establishing by quantitative and/or qualitative techniques the worth of information system projects to the organizations.),Therefore valuation is the assessment on effectiveness of the information system with respect to what a system actually accomplishes in relation to its stated goals (Al-Yaseen et al., 2004). Evaluation can also be defined as a process that takes place at different points in time, or continuously, explicitly searching for (quantitatively or qualitatively) the impact of information system projects (Eldabi et al., 2003). All the above definitions agree that information system evaluation is the systematic endeavor which involves collection of data, analyzing them, making judgment and finally provides useful feedback about the worth or merit of an information system.

Goals of Information System evaluation

Many organizations in developed and developing countries in both private and public sectors- turned to information systems to meet the increasing demands on organizations to increase their efficiency and effectiveness (Jones and Hughes, 2000). These organizations then invest a large amount of money in developing information systems. However, there is a contradictory evidence as to whether or not information system expenditure has resulted in creating enough benefits for the organizations (Willcocks and Lester, 1999; Eldabi et al., 2003; Irani et al., 2002; Al-Yaseen, et al., 2006; 2008). The considerable financial investment by organisations in information systems underlines the importance of evaluating them (Saarinen, 1996).

According to Trochim (2006), evaluation of information systems is conducted to provide useful feedback to a variety of audiences including sponsors, donors, client-groups, administrators, staff and other relevant constituencies. Feedback is perceived as "useful" if it aids in decision-making. Ferguson et al (2005) pointed out that, Information System evaluation attempts to assess whether the desired outcomes of system development were achieved successfully. Since the 1970s, there has been considerable research into measuring 'success' and determining the success criteria of information systems.

Information system evaluation as significant part of successful information system development

In traditional structured systems analysis and design approach, evaluation is conducted twice: first, in the feasibility phase, in which an attempt is made to establish likely impact and costs, and, second, in the form of a post-implementation evaluation, which is an attempt to measure what impact the system actually had (Smithson and Hirschheim ,1998; Serafeimidis, 2002). Effective post-implementation evaluation of an information system is required to be conducted in order to declare that the system development is successful.

There is a range of success factors for any information system development. In their influential research, DeLone and McLean (1992) proposed that a set of six interrelated success factors existed: system quality; information quality; use; user satisfaction; individual impact; and organisational impact. More than a decade later, they revisited their model in order to propose an update that incorporated changes in the information system arena.

The information system by DeLone and Mc model (2003) has six variables which are individually important components of success but, in the measurement of the overall success of the information system, they are interrelated. 'System quality' measures the desired characteristics of the system or service (including usability, availability, reliability, adaptability and response time), 'information quality' focuses on content, while 'service quality' refers to the overall support delivered by the service provider (DeLone and McLean 2003). Of these components, user satisfaction has emerged strongly in information system research as the key measure of success for information systems development (Sanga and Venter, 2009).

User satisfaction as a measure of success of information system

User satisfaction is defined by Ives et al. (1983) as the extent to which users believe the information system available to them meets their information requirements. User satisfaction is a complex variable, subjective and can vary according to external influences. Bailey and Pearson (1983), have a similar view believing that satisfaction in a given situation is the sum of one's feelings or attitudes toward a variety of factors

affecting the information system use. Satisfaction with information seeking is a state of mind which represents the composite of a user's material and emotional responses to the information-seeking context. This state of mind can be influenced by a number of factors. In undertaking a literature-based analysis of the variables affecting ICT end-user satisfaction, Mahmood et al. (2000) divided these factors into three major categories: perceived benefits and convenience; user background and involvement; and organisational attitude and support. Moreover, even these can be affected by other factors such as limited time or user attitude, which can vary from day to day and moment to moment.

The concept of satisfaction is indeed multi-faceted, but there are many researchers who consider user satisfaction to be an appropriate indicator and valid measure of information system success (DeLone and McLean,1992; Gatian 1994; Jiang et al., 2001; Guimaraes et al.,1996; Lin and Shao, 2000; Gelderman 1998; Mahmood et al., 2000). DeLone and McLean (1992) explained as outlined below why they believe user satisfaction has been the most widely used single measure of information system success.

- Satisfaction has a high degree of face validity - it is hard to deny the success of a system which its users say that they like.
- The development of the Bailey and Pearson instrument and its derivatives has provided a reliable tool for measuring satisfaction and for making comparisons among studies.
- The appeal of satisfaction as a success measure is because most of the other measures are so poor; they are either conceptually weak or empirically difficult to obtain.
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Galletta and Lederer (1989) outline why measurement of user satisfaction is important. For the researcher, the ability to investigate generalisable relationships of user satisfaction with other variables, such as training, may provide a better understanding of the information system environment. From a practitioner's perspective, user satisfaction can be harnessed as a feedback mechanism to highlight user perception of strengths and weaknesses. The strengths can be used for recognition and reinforcement of the system or service, while the weaknesses signal areas for improvement. Garrity and Sanders (1998) also emphasised that if user satisfaction is ignored during evaluation, system failures may result even in cases which there are clear technical or organisational benefits.

3. EVALUATION OF USER SATISFACTION OF THE INFORMATION SYSTEM

Information system user satisfaction and information system usability

User satisfaction of information system is strongly attached to information system usability. It is one of the key component of system usability. As defined in ISO 9241-11 (1996), usability is the effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments. Also the ISO 9126-1 (2001) defined usability as the capability of the software to be understood, learned, used and liked by the user, when used under specified conditions.

The ideal way of evaluating usability of the information system is to specify usability attributes and measure them. These attributes are carefully selected depending on the context in which the product is used. Usability of theinformation system can be evaluated from mainly two different perspectives: “ease-of-use” and “quality-in-use”(Van Veenendaal, 2002). Nielsen (1993) gives a brief explanation of different usability attributes for the “ease-of-use” perspective. These attributes are as detailed below:-

i. **Learnability** - the system should be easy to learn so that the user can rapidly start getting some work done with the system.
ii. **Efficiency** - the system should be efficient to use, so that once the user has learned the system, a high level of productivity is possible.
iii. **Memorability** - the system should be easy to remember, so that the casual user is able to return to the system after some period of not having used it, without having to learn everything all over again.
iv. **Errors** - the system should have a low error rate, so that users make few errors during the use of the system, and so that if they do make errors they can easily recover from them. Furthermore, catastrophic errors must not occur.
v. **Satisfaction** - the system should be pleasant to use, so that users are subjectively satisfied when using it; they like it

When evaluating information system by the “quality in use” perspective, three attributes are considered very important. These are effectiveness, efficiency and user satisfaction as explained below(Van Veenendaal, 2002)

i. **Effectiveness**: the extent to which the intended goals of use of the system are achieved.
ii. **Efficiency**: the resources such as time, money or mental effort that have to be spent to achieve the intended goals.
iii. **Satisfaction:** the extent to which the user finds the overall system acceptable.

As we have seen that there are two perspectives in evaluating information system usability and both of these perspectives contain user satisfaction as the key attribute. In this study the “quality-in-use” perspective will be used. The quality-in-use perspective takes care of the overall information system. The overall information system consists of the users, tasks,

equipments and environments which are studied along side the three attributes (Bevan and Macleod, 1994).

Choosing tasks, users and environments for measuring user satisfaction

The choice of appropriate types of user, tasks and environments in measuring user satisfaction depends on the objectives of the evaluation and the context of use.In order to measure the system's user satisfaction effectively,there should be real users carrying out real tasks in their real environments. Care should be taken in generalising results of any measurement of satisfaction in one context to another context which may have significantly different types of users, tasks or environments (Bevan and Macleod, 1994).

Measures of satisfaction describe the perceived usability of the overall system by its users and the acceptability of the system to the people who use it and to other people affected by its use.There are variety of methods for measuring user satisfaction of information system. These methods differ in terms of cost incurred, equipments used, human resource required and to the system development phase that can be applied. The methods such as Pluralistic walk through, Ethnographic study, Focus group discussions, Think aloud protocol, Remote testing, Questionnaires (SUMI, QUIS, PUTQ, CSUQ, PUEU, etc) and Production feedback (Fenlason and Kurlander, 2003). Measures of satisfaction can provide a useful indication of the user's perception of usability, even if it is not possible to obtain measures of effectiveness and efficiency.

This study opted to evaluate the usability of LINKS by measuring user satisfaction using altitude rating scale questionnaire"SUMI".

Evaluation of information system usability by measuring user satisfaction using SUMI

Software Usability Measurement Inventory (SUMI) is a tool used to measure user satisfaction, and hence assesses quality of a software product from a user's perspective. University College Cork has developed SUMI as part of the MUSiC project (Kirakowski et al.,1992). SUMI is an internationally standardised 50-item questionnaire, available in different languages; English, German, Dutch, Spanish and Italian. It takes approximately 10 minutes to complete the questionnaire.

At least 10 representative users are required to get accurate results with SUMI. The results which SUMI provide are based on an extensive standardisation database built from data on a full range of software products such as word processors, spreadsheets, CAD packages, communications programs etc. SUMI results is valid and reliable as it is recognized method by the ISO 9241 for testing user satisfaction. SUMI provides three types of measures: an Overall Assessment, a Usability Profile, and Item Consensual Analysis which gives more detailed information (Bevan and Macleod, 1994).

Overall Assessment

This is a general global assessment of usability, and it is given by a single numerical figure. The global assessment is useful for setting targets, and for quick comparisons between many products or versions of the same product. Output is given in a standard format on a scale of 0 to 100 with a mean of 50 and a standard deviation of 10, so that most software products will score somewhere between 40 and 60.

Profile of Perceived Usability

This breaks the Overall Assessment down into 5 sub-scales as described below:

i. **Efficiency:** degree to which the user can achieve the goals of his interaction with the product in adirect and timely manner
ii. **Affect:** how much the product captures the user's emotional responses
iii. **Helpfulness:** extent to which the product seems to assist the user
iv. **Control:** degree to which the user feels that he, and not the product, is setting the pace
v. **Learnability:** ease with which a user can get started and learn new features of the product.

The subscales represent the dimensions with which end users structure their judgement when they assess the usability of software.The sub-scales were identified, confirmed and validated by factor analysis of large amounts of data collected during the development of SUMI and its predecessors, and by discussion with software engineers, human factors experts, end users, etc. Items which make up these subscales have been drawn from a large sample item pool, and have been selected on the basis of their discriminatory power. Output is on a scale of 0 to 100 as for overall assessment.

Item Consensual Analysis

Item Consensual Analysis lists out those items on which the information system being rated was significantly better or worse than the standard of comparison. This gives an indication of specific aspects of the software which people consistently like or dislike. It is thus possible to go back and interview users to find out why they gave these ratings. This gives diagnostic information of potential usability defects in the software.
This research study will employProfile of Perceived Usability measure to obtain the user satisfaction on LINKS software.

LINKS as the information Software under evaluation

LINKS is a web based livestock marketing Information System. Its development started in 2005 under the Global Livestock Collaborative Research Support Project (GL-CRSP) funded by USAID. This system is used by Tanzania, Kenya, Uganda and Ethiopia, where each country run its own system. For Tanzania LINKS is under the Government of Tanzania through the Ministry of Industry and Trade since June 2009. In Tanzania, the system covers 53 livestock markets of which 41 are primary livestock markets and 12 are secondary livestock markets spread over all districts (CNRIT, 2011).

LINKS Functions

The system aimed at establishing a livestock marketing database for planning, research and monitoring of marketing trends. The system collects livestock market information (through market monitors using mobile phone technology), processes the information and reports the results as market prices and volumes of different species of livestock. The market prices and volumes are provided at real-time to all players in livestock marketing through various media. It also provides early warning information to inform decision making for livestock producers, traders, government and non-government organizations and other users who may find this information relevant and useful for their interventions (CNRIT, 2011).

Data Collection

LINKS collects livestock products data such as amount of meat, milk, hide and skin and livestock marketing data such as prices and volumes on cattle, camel, sheep, goats, donkeys and horses. Data collection at respective markets is done by trained monitors provided with mobile phones and air time. To ensure consistency each monitor follows the guiding principle on livestock data collection as listed hereunder:-

- Observe the market and identify the dominant animal categories.
- Approach buyers for price information.
- Collect data for 5 animals for each dominant animal category and should be of the same species, breed, age class, gender and grade (e.g. Cattle, Boran, Mature, Male and Grade 2).
- Record the price of each animal on the data sheet
- Calculate the average for the 5 entries.
- Obtain total volume of animals by species from relevant source
- Code the data, feed to cell phone as text message and send to server. The acceptable format is Sender S Region MarketName Year*Month*Date Animal*Breed*VolumeAge/Class*2*Price (e.g. MK S DAR CHASSAMA 2011*08*10 C*TSZ*500 MM*2*22020)
- Once the message is accepted at the database, it is decoded and stored as full information(CNRIT, 2011).

Data Analysis and Reporting

LINKS perform several analyses in which Trend Analysis is the major one. Trend Analysis inform stakeholders on trend of prices and volume of specific livestock from different market in Tanzania. Two options of accessing information from the system, these are through SMS (e.g. MK R ARU Send to 0787-441555) and through the Internet (http://www.lmistz.net). When accessing information on the Internet, LINKS provides marketing information in the form of full reports or tailored reports. Also livestock marketing information is manually disseminated through Television, Radios, Community Information Centers, News papers and via e-mail to several organizations(CNRIT, 2011).

Challenges

LINKS faces two main challenges which are sustainability and information targeting and access. As the system is run by the Ministry of Industry and Trade, funds to sustain the system are not enough. Resourcesare required for maintaining system's hardware, software, and technical personnel. Also funds are needed in facilitating market monitoring through conducting regular field visits to ensure the accuracy of monitors' data and reliability of system's reports. Information targeting and access in LINKS is not well planned. Access of livestock marketing information from LINKS is mainly through SMS, Internet, Television, Radios, Community Information Centers, News papers and e-mail. All of these methods are said to favor traders than producer because traders have easy access and more capability of using these media. The primary information target for LINKS was producers as they are actually not well informed on livestock marketing issues. Although there is no formal and comprehensive research done to study that scenario, livestock stakeholders feel that information from LINKS mainly reach traders than producers (Mapunda, 2011 and Chassama, 2011).

4. METHODOLOGY

Research Paradigm

This study used qualitative paradigm, simply because it is most applicable for natural setting and give the researcher more power to control the research process (Kombo and Trompo, 2006). The strengths of qualitative research methodology lie in their usefulness for understanding the meaning and context of the phenomena studied, and the particular events and processes that make up these phenomena over time, in real-life and in natural settings (Maxwell, 1996). When evaluating computer information systems, these contextual issues include social, cultural, organizational, and political concerns surrounding an information technology. Other issues are the processes of information systems development, installation and use (Kaplan and Shaw, 2004).

Research Design

A research design refers to the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance with the research purpose. It is the conceptual structure within which research is conducted. It constitutes the blue print for the collection, measurement and analysis of data (Kothari, 2004). This study used the case study design in order to get intensive information about the LINKS. The case study provides a unique example of real people in real situation for understanding ideas more clearly (Cohen et.al, 2000).

Area of the Study

The study was conducted in Morogoro region. The study was undertaken particularly in Kilosa districts. This district was chosen because of presence of potential livestock traders and producers.

Study Population

The target population of the study were LINKS users who were categorised into livestock producers and livestock traders operating in Kilosa district.

Sample

The study employed sixty (60) respondents. This representative and provides valid results. The sample included forty five(45) livestock producers and fifteen (15) livestock traders. The livestock traders and producers were equally drawn from three wards of Kilosa district with the largest number of livestock.

Sampling technique

Simple random sampling t technique was used to select the fifteen (15) livestock producers and the five (5) livestock traders from each ward.

Methods of data collection

A semi-structured questionnaire was administered in Kiswahili. The questionnaire was only administered to livestock producers and traders who use LINKS in their trading activities. The questionnaire intended to evaluate the user satisfaction of LINKS.

Data Analysis

Data analysis was carried involving editing, coding, classification and tabulation of collected data (Kothari, 1990). The data collected from the first questionnaire were entered, edited, coded and finally analyzed with the help of computer programme, namely, Statistical Package for Software System (SPSS). The data collected from the questionnaire was analysed and the results were presented in Tables as shown below.

4. RESULTS

4.1 Demographic characteristics of respondents

Results in Tables 1 and 2 show the categories and demographic structure of the respondents involved in the study. It is indicated that most of the producers were males 36 (80%) and 9 (20%) were females. The same case applies to the traders where most of them were males 12(80%) compared to their female counterparts 3(20%). These results are an indication that most of the respondents who accessed and used the Livestock Information Network and Knowledge System were males. This could probably be due to the fact that males are usually early adapters to technology than females. Results in Table 1b show that no respondents with age groups of 15-20 years were involved in the study. Very few producers (9%) and traders (7%) were aged between 21-30 years. Some of the producers (40%) and traders (40%) were aged 31-40 years. More than half of the respondents were aged above 40 years where 51% were producers and 53% were traders. These results suggest that LINKS is used mostly by respondents that are above 30 years of age.

Table 1: Categories of respondents in Tindiga, Kilangali and Madoto wards of Kilosa District

Respondents' category	*Ward of residence*	*Male*		*Female*		*Overall*	
		n	***%***	***n***	***%***	***N***	***%***
Producer	Tindiga	12	33	3	33	15	33
	Kilangali	13	36	2	22	15	33
	Madoto	11	31	4	44	15	33
Sub total		***36***	***80***	***9***	***20***	***45***	***100***
Trader	Tindiga	4	33	1	33	5	33
	Kilangali	4	33	1	33	5	33
	Madoto	4	33	1	33	5	33
Sub total		***12***	***80***	***3***	***20***	***15***	***100***
Total		**48**	**80**	**12**	**20**	**60**	**100**

Table 2: Age distribution of respondents

Respondents' category	*Age groups*	*Male*		*Female*		*Overall*	
		n	***%***	***n***	***%***	***N***	***%***
Producer	15-20	0	0	0	0	0	0
	21-30	4	11	0	0	4	9
	31-40	14	39	4	44	18	40
	> 40	18	50	5	56	23	51
Sub total		***36***	***80***	***9***	***20***	***45***	***100***
Trader	15-20	0	0	0	0	0	0
	21-30	1	8	0	0	1	7
	31-40	5	42	1	33	6	40
	> 40	6	50	2	67	8	53
Sub total		***12***	***80***	***3***	***20***	***15***	***100***
Total		**48**	**80**	**12**	**20**	**60**	**100**

4.2 Information Content Vs Needs

The respondents were asked to state whether the information content of the system met their needs. Results in Table 3 show that while 33% of the producers and 40% of the traders agreed that the information content met their needs, other producers (31%) and Traders (20%) disagreed and some of the producers (16%) and traders (7%) were neutral. These results indicate that only some of the respondents' information needs can be met through LINKS.

Table 3: Information content and respondents needs

3. The information content of the system meets your needs	*Wards*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***N***	***%***
Producer	Tindiga	1	7	3	20	2	13	5	33	4	27	15	100
	Kilangali	0	0	5	33	0	0	5	33	5	33	15	100
	Madoto	2	13	7	47	0	0	4	27	2	13	15	100
Sub total		***3***	***7***	***15***	***33***	***2***	***4***	***14***	***31***	***11***	***24***	***45***	***100***
Traders	Tindiga	1	20	2	40	0	0	1	20	1	20	5	100
	Kilangali	0	16	2	40	1	20	1	20	1	20	5	116
	Madoto	1	20	2	40	0	0	1	20	1	20	5	100
Sub total		***2***	***13***	***6***	***40***	***1***	***7***	***3***	***20***	***3***	***20***	***15***	***100***
Total		**5**	**8**	**21**	**35**	**3**	**5**	**17**	**28**	**14**	**23**	**60**	**100**

4.3 Sufficient information.

The respondents were asked whether the system provided sufficient information for their needs. Results in Table 4 show that 22% of the producers and 47% of the traders agreed while 47% of the producers and 27% of the traders disagreed. The overall results show that almost half of the respondents (42%) disagreed and only 28% of them agreed. This is an indication that the the information provided by LINKS to some extent does not meet user needs.

Table 4: Response on suffience of information provided by LINKS

4. The system provides sufficient information to your needs	*Wards*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*N*	*%*
Producer	Tindiga	0	0	3	20	3	20	7	47	2	13	15	100
	Kilangali	0	0	3	20	2	13	9	60	1	7	15	100
	Madoto	0	0	4	27	2	13	5	33	4	27	15	100
Sub total		***0***	***0***	***10***	***22***	***7***	***16***	***21***	***47***	***7***	***16***	***45***	***100***
Traders	Tindiga	0	0	3	60	0	0	1	20	1	20	5	100
	Kilangali	0	0	2	40	0	0	2	40	1	20	5	100
	Madoto	0	0	2	40	1	20	1	20	1	20	5	100
Sub total		***0***	***0***	***7***	***47***	***1***	***7***	***4***	***27***	***3***	***20***	***15***	***100***
Total		**0**	**0**	**17**	**28**	**8**	**13**	**25**	**42**	**10**	**17**	**60**	**100**

4.4 System Accuracy

The respondents were asked to state whether the system was accurate or not. Results in Table 5 show that 27% of the traders strongl agreed that the system is accurate, also 51% of the producers and 40% of the traders agreed that the system is accurate, while 27% o the producers and 20% of the traders disagreed. A few of the producers (7%) and traders (7%) remained neutral. These result suggestthat most of the respondents who use LINKS can access and use accurate information for their needs.

Table 5: Producers and Traders response on LINKS accuracy

5. The system is accurate	*Wards*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*N*	*%*
Producer	Tindiga	0	0	7	47	2	13	4	27	2	13	15	100
	Kilangali	0	0	8	53	0	0	5	33	2	13	15	100
	Madoto	0	0	8	53	1	7	3	20	3	20	15	100
Sub total		***0***	***0***	***23***	***51***	***3***	***7***	***12***	***27***	***7***	***16***	***45***	***100***
Traders	Tindiga	1	20	2	40	1	20	1	20	0	0	5	100
	Kilangali	2	40	1	20	0	0	1	20	1	20	5	100
	Madoto	1	20	3	60	0	0	1	20	0	0	5	100
Sub total		***4***	***27***	***6***	***40***	***1***	***7***	***3***	***20***	***1***	***7***	***15***	***100***
Total		**4**	**7**	**29**	**48**	**4**	**7**	**15**	**25**	**8**	**13**	**60**	**100**

4.5 Satisfaction with accuracy of information

The respondents were asked whether they were satisfied with the accuracy of the information provide by in LINKS. Results in Table 6 show that 25% of the producers strongly agreed, also 56% of the producers and 60% of the traders ageed that they were satisfied with the accuracy of information in LINKS. Other 24% of the producers and 20% of the traders disagreed on the accuracy of information, while 16% of the producers strongly disagreed. These results suggest that most of the respondents are satisfied with the accuracy of the information that is availed by LINKS, though quit a few of them were not satisfied.

Table 6: Repondents satisfactory level on accuracy of information in LINKS

6. You are satisfied with the accuracy of the system	*Year of study*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*N*	*%*
Producer	Tindiga	0	0	8	53	0	0	5	33	2	13	15	100
	Kilangali	0	0	9	60	1	7	3	20	2	13	15	100
	Madoto	0	0	8	53	1	7	3	20	3	20	15	100
Sub total		***0***	***0***	***25***	***56***	***2***	***4***	***11***	***24***	***7***	***16***	***45***	***100***
Traders	Tindiga	0	0	2	40	1	20	1	20	1	20	5	100
	Kilangali	0	0	3	60	1	20	1	20	0	0	5	100
	Madoto	0	0	4	80	0	0	1	20	0	0	5	100
Sub total		***0***	***0***	***9***	***60***	***2***	***13***	***3***	***20***	***1***	***7***	***15***	***100***
Total		**0**	**0**	**34**	**57**	**4**	**7**	**14**	**23**	**8**	**13**	**60**	**100**

4.6 Format of outputs of LINKS

The respondents were asked whether the output of the system was presented in a useful format. While some of the producers (13%) and traders (20%) strongly agreed, most of the producers (62%) and some of the traders (47%) agreed that the output was presented in a useful format. A few of the producers (24%) and traders (20%) disagreed, while very few of the traders (7%) were neutral. These results indicate that most of the respondents find the output of LINKS to be presented in a way that is useful to them.

Table 7: Respondents' opinions on outputs format

7. The output of the system is presented in a useful format	*Wards*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*N*	*%*
Producer	Tindiga	2	13	9	60	0	0	4	27	0	0	15	100
	Kilangali	1	7	11	73	0	0	3	20	0	0	15	100
	Madoto	3	20	8	53	0	0	4	27	0	0	15	100
Sub total		***6***	***13***	***28***	***62***	***0***	***0***	***11***	***24***	***0***	***0***	***45***	***100***
Traders	Tindiga	1	20	2	40	1	20	1	20	0	0	5	100
	Kilangali	1	20	2	40	0	0	1	20	1	20	5	100
	Madoto	1	20	3	60	0	0	1	20	0	0	5	100
Sub total		***3***	***20***	***7***	***47***	***1***	***7***	***3***	***20***	***1***	***7***	***15***	***100***
Total		**9**	**15**	**35**	**58**	**1**	**2**	**14**	**23**	**1**	**2**	**60**	**100**

4.7 Clarity of information

The respondents were asked whether the system information was clear enough. Results in Table 8 show that while 7% of the producers and 33% of the traders strongly agreed, almost half of the producers (51%) and traders (47%) agreed. These results further reveal that 22% of the producers and 13% of the traders disagreed. Very few of the respondents were neutral. These results indicate that the majority of the respondents find the system informationto be clear.

Table 8: Respondents' opinions on claritity of information

8. The system information is clear	*Wards*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*N*	*%*
Producer	Tindiga	1	7	8	53	0	0	4	27	2	13	15	100
	Kilangali	2	13	7	47	1	7	3	20	2	13	15	100
	Madoto	0	0	8	53	1	7	3	20	3	20	15	100
Sub total		***3***	***7***	***23***	***51***	***2***	***4***	***10***	***22***	***7***	***16***	***45***	***100***
Traders	Tindiga	1	20	3	60	1	20	0	0	0	0	5	100
	Kilangali	2	40	2	40	0	0	1	20	0	0	5	100
	Madoto	2	40	2	40	0	0	1	20	0	0	5	100
Sub total		***5***	***33***	***7***	***47***	***1***	***7***	***2***	***13***	***0***	***0***	***15***	***100***
Total		**8**	**13**	**30**	**50**	**3**	**5**	**12**	**20**	**7**	**12**	**60**	**100**

4.8 Timeliness

The respondents were asked whether they get information from the system at a suitable time. Results in Table 9 show that 27% of the producers and 20% of the traders strongly agreed while 49% of the producers and 53% of the traders agreed. The results further reveal that other 22% of the producers and 20% of the traders disagreed while 2% of the producers and 7% of the traders remained neutral. These results are an indication that most of the respondents who were under study got information from LINKS in a timely manner.

Table 9: Timeliness of information needed from the system at a suitable time

9. You get the information you need from the system at a suitable time	*Wards*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*N*	*%*
Producer	Tindiga	4	27	7	47	1	7	3	20	0	0	15	100
	Kilangali	4	27	8	53	0	0	3	20	0	0	15	100
	Madoto	4	27	7	47	0	0	4	27	0	0	15	100
Sub total		***12***	***27***	***22***	***49***	***1***	***2***	***10***	***22***	***0***	***0***	***45***	***100***
Traders	Tindiga	1	20	2	40	1	20	1	20	0	0	5	100
	Kilangali	1	20	3	60	0	0	1	20	0	0	5	100
	Madoto	1	20	3	60	0	0	1	20	0	0	5	100
Sub total		***3***	***20***	***8***	***53***	***1***	***7***	***3***	***20***	***0***	***0***	***15***	***100***
Total		**15**	**25**	**30**	**50**	**2**	**3**	**13**	**22**	**0**	**0**	**60**	**100**

4.9 Up-to-date information

Respondents were asked whether the system provides an up-to-date information. Results in Table 10 indicate that 13% of the producers and 20% of the traders strongly agreed. Most of the producers (60%) and traders (47%) agreed while some few producers (24%) and traders (20%) disagreed. Very few producers (2%) and traders (7%) were neutral. These findings mean that the majority of respondents agreed that they got current information from LINKS as opposed to the few respondents who were either neutral or disagreed.

Table 10: Respondents opinions on presence of up-to-date information in the LINKS

10. The system provides an up-to-date information	*Wards*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*N*	*%*
Producer	Tindiga	1	7	9	60	1	7	4	27	0	0	15	100
	Kilangali	3	20	9	60	0	0	3	20	0	0	15	100
	Madoto	2	13	9	60	0	0	4	27	0	0	15	100
Sub total		***6***	***13***	***27***	***60***	***1***	***2***	***11***	***24***	***0***	***0***	***45***	***100***
Traders	Tindiga	0	0	3	60	1	20	1	20	0	0	5	100
	Kilangali	1	20	2	40	0	0	1	20	1	20	5	100
	Madoto	2	40	2	40	0	0	1	20	0	0	5	100
Sub total		***3***	***20***	***7***	***47***	***1***	***7***	***3***	***20***	***1***	***7***	***15***	***100***
Total		**9**	**15**	**34**	**57**	**2**	**3**	**14**	**23**	**1**	**2**	**60**	**100**

4.10 System's user friendliness

The respondents were asked whether the system is user friendly or not. Results in Table 11 show that only 7% of the traders strongly agreed while 27% of the producers and 20% of the traders agreed. The results further reveal that 11% of the producers and 13% of the traders were neutral while 40% of the producers and 27% of the traders disagreed. These results are an indication that only a few respondents found the system to be user friendly, some of the respondents seemed to have difficulties with using the LINKS to access information.

Table 11: System's user friendliness

11. The system is user friendly	*Wards*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*N*	*%*
Producer	Tindiga	0	0	4	27	2	13	6	40	3	20	15	100
	Kilangali	0	0	3	20	3	20	5	33	4	27	15	100
	Madoto	0	0	5	33	0	0	7	47	3	20	15	100
Sub total		***0***	***0***	***12***	***27***	***5***	***11***	***18***	***40***	***10***	***22***	***45***	***100***
Traders	Tindiga	0	0	1	20	0	0	2	40	2	40	5	100
	Kilangali	1	20	1	20	1	20	1	20	1	20	5	100
	Madoto	0	0	1	20	1	20	1	20	2	40	5	100
Sub total		***1***	***7***	***3***	***20***	***2***	***13***	***4***	***27***	***5***	***33***	***15***	***100***
Total		**1**	**2**	**15**	**25**	**7**	**12**	**22**	**37**	**15**	**25**	**60**	**100**

Ease of use

The respondents were asked whether the system is easy to use. Results in Table 12 show that 27% of the producers and 40% of the traders agreed that the system is easy to use, while 44% of the producers and 33% of the traders disagreed that the system is not easy to use. The overall results show that 30% of all the respondents agreed while 42% of all the respondents disagreed. These results are an indication that only a few of the respondents found the system easy to use while other respondents used it with difficulties.

Table 12: Ease of use of the system

12. The system is easy to use	*Year of study*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***N***	***%***
Producer	Tindiga	1	7	3	20	0	0	8	53	3	20	15	100
	Kilangali	0	0	5	33	2	13	4	27	4	27	15	100
	Madoto	0	0	4	27	0	0	8	53	3	20	15	100
Sub total		***1***	***2***	***12***	***27***	***2***	***4***	***20***	***44***	***10***	***22***	***45***	***100***
Traders	Tindiga	0	0	2	40	0	0	2	40	1	20	5	100
	Kilangali	0	0	2	40	1	20	1	20	1	20	5	100
	Madoto	0	0	2	40	1	20	2	40	0	0	5	100
Sub total		***0***	***0***	***6***	***40***	***2***	***13***	***5***	***33***	***2***	***13***	***15***	***100***
Total		**1**	**2**	**18**	**30**	**4**	**7**	**25**	**42**	**12**	**20**	**60**	**100**

Cost of use

The respondents were asked on the costs associated with use of the system . Results in Table 13 show that 24% of the producers and 25% of the traders strongly agreed that using the system was cheap. More than half of the producers (58%) and traders (53%) agreed while only 18% of the producers and 20% of the traders disagreed. There results suggest that using LINKS is cheap since the majority of the respondents have shown positive responses.

Table 13: Summary of responses regarding the cost of using the system

13. Using this system is cheap	*Year of study*	*Strongly Agree*		*Agree*		*Neutral*		*Disagree*		*Strongly Disagree*		*Total*	
		n	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***n***	***%***	***N***	***%***
Producer	Tindiga	5	33	8	53	0	0	2	13	0	0	15	100
	Kilangali	4	27	8	53	0	0	3	20	0	0	15	100
	Madoto	2	13	10	67	0	0	3	20	0	0	15	100
Sub total		***11***	***24***	***26***	***58***	***0***	***0***	***8***	***18***	***0***	***0***	***45***	***100***
Traders	Tindiga	2	40	2	40	0	0	1	20	0	0	5	100
	Kilangali	1	20	3	60	0	0	1	20	0	0	5	100
	Madoto	1	20	3	60	0	0	1	20	0	0	5	100
Sub total		***4***	***27***	***8***	***53***	***0***	***0***	***3***	***20***	***0***	***0***	***15***	***100***
Total		**15**	**25**	**34**	**57**	**0**	**0**	**11**	**18**	**0**	**0**	**60**	**100**

4.11 General comments

The respondents were asked to give generalcomments on the system. About 38% of the respondents commented that the system is not reliable especially on prices. This was followed by 17% of the respondents who said that it is difficult to use the system as you need to memorize a lot of things. Other 15% of the respondents said that the system is good because it uses sms while 13% of them commented that the customer services of the system are very poor. A few respondents (8%) said that the system is ok as it helps to get an ideaof prices in different markets across the country while the remaining 8% of the respondents had no idea. From these results it is observed that though a few of the respondents had a positive opinion that they could access information via sms, some of these respondents were not satisfied with the system based on the fact that they could not get reliable prices. A few of the respondents were also not satisfied with customers services offered by the system and others found it difficult to use the sysem.

4.12 Recommendation for improvements

The respondents were asked to give their recommendations for improvement. Results show that 38% of the respondents recommendend on improvement of market survey strategies to ensure that the system provide reliable information. Some (22%) of the respondents recommended that the system should be made more descriptive to make it easier to use. Other (18%) of the respondents recommended for improvement of network coverage while 15% of the respondents recommended for improvement of customer care services.

5. DISCUSSION

Technological advances have been intrumental in modernization of different sectors with socioeconomical impacts. It is through the use of Information Technology, information can easily be sought, processed, and effictively communicated to users. LINKS as Livestock Marketing Information System was developed to support decision making of all stakeholders in livestock sector. LINKS increases the market transparency by providing information on prices and volumes of various livestock species sold in major markets across Tanzania. The study evaluated only satisfaction of traders and producers on using LINKS leaving aside other key users of the system such as consumers, processors, transporters, input supplier and regulatory authories. Despite the study findings that livestock producers and traders are generally satisfied with the services provided by LINKS, Further studies need to be conducted to include the other key users of LINKS. Evaluation of LINKS by involving all key users will determine its real user satisfaction, market efficiency and impacts.

According to the Word Bank (2010), in Sub-Sahara Africa women are largely responsible for small scale production, selling and marketing livestock in local markets. While men deal with large scale production, selling and marketing livestock in a distant markets. The study of food market liberalization in Tanzania found that 75 per cent of traders in the sample were male and that women were mainly concentrated among local traders (Brycesonís, 1993). The results coincide with the findings of this study that majority (80%) of LINKS users are men who dominate livestock production and trade activities. Women normally participate in small scale animal production and sell their products in local markets or in a location where they have established contacts, thus eliminate the need for them to use marketing information system. Increasing the volume of women in production activities and breaking the cultural barriers which restrict women from active engagement in livestock production and trading activities can increase the number of women using LINKS.

Findings from this study showed that livestock producers and traders are generally satisfied with the contents, accuracy, format, clarity and timeliness of the information provided by LINKS. This is contrary to results reported by other researchers on Livestock Marketing Information System. Jama et al (2006) conducted an assessment of Livestock Market Information Systems in the highland regions of Ethiopia. The assessment found that traders and producers lack trust on the information provided by existing formal livestock market information system. They said that majority of the available livestock market information provided by the systems are outdated, inaccurate, unclear and do not satisfy their needs, hence commercially useless. According to Lee (2010) users are satisfied if the system output is appropriate, correct and in a desirable format. The system should be also easy to use, equipped with friendly interface and should accommodate the different levels of understanding by the users. Furthermore, user interface needs to be comprehensible, and visibly attractive to the user. Post implementation evaluation which has been done under this study shows the importance of incoporating users needs during early stages of system implementation. This is very important to enhance system acceptance by users.

6. CONCLUSION

From this study user satisfaction was measured by SUMI which is one among subjective assessment approaches. This approach gives the evaluator information about how the users feel about using the software being evaluated (i.e. LINKS). Thus SUMI does not measure how well users perform with LINKS (effectiveness). Also, SUMI does not measure how efficiently users work with LINKS (efficiency). The results indicate the need to adopt user centred system development where by system development is done participatory with all stakeholders. The goal for advocating SUMI is that user requirements need to be identified in collaboration with end

user to avoid system rejection after systems' evaluation. Future research should focus on improving human computer interaction (HCI) of LINKS.

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