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ABSTRACT: The study looked at the effects of information quality generated by from the semi-automated manufacturing processes in Zimbabwe. The country had faced major economic problems between 1997 and 2013. The multilateral agencies stopped the balance of payment support as the government failed to meet targeted goals (Ndlela 2011). Technologically the country had fallen behind and this affected the information quality. To measure, the information quality impact, DeLone and McLean information systems (IS) success model (2003) was used as a framework. This impact had not been measured in the Zimbabwe manufacturing sector. A qualitative approach was employed and 12 manufacturing companies were interested to participate in the study. Interviews, observations, documentary analysis and open-ended questionnaires were used to generate data. The results showed that the systems provided data, that is, unprocessed information. The impact of the processed information was found to be low as delays were experienced in data processing. A low impact of information quality on the usage and users was experienced. The quality had also low impact on system usage and company benefits. The usage of information had little influence on user satisfaction. The researcher concluded that there was a wide technology gap between Zimbabwe and developed countries.

Keyword: Semi-Automated Systems, Information Quality, System Use, User Satisfaction and Net Benefits

I. Background of the Study

Zimbabwe is a landlocked country in southern Africa. It had had experienced unprecedented economic problems in the last two decades. This study looked at the country’s manufacturing sector between 1997 and 2013. The manufacturing output declined from -0.8% in 1997 to -12% in 2008. The sector had only 1260 companies, at independence, in 1980 (Kanyenze 2006). By 2012, the number of companies had gone down to 912 (ZIMSTAT 2012). The growth became unsustainable leading to a serious deficit. The government relied on internal and external borrowing to finance massive drought relief imports owing to severe drought of 1991-92. It introduced the economic structural adjustment programme (ESAP) that was abandoned in 2002 as it failed to achieve the set economic goals. A currency crisis occurred in 1997 as a result of overvaluation of Zimbabwean dollar. The free market currency collapsed. The multilateral agencies stopped the balance of payment support owing to growth of political instability and government failure to meet performance targets (Ndlela 2011).

The other challenge the manufacturing industry faced was the loss of technically qualified and experienced manpower. The levels of employment for the textile and clothing industries shrunk from 24 000 and 27 000 in 1990 to 11 522 and 17 300 in 2005 (Kanyenze 2006). Qualified computer professionals left the country as it could not compete with some of its neighbours in terms of salaries. Technologically Zimbabwe had fallen behind other countries. This affected the information quality hence the product quality.

The exchange rate was high and the computers and computer spares became very expensive. Before
1997, the information technology sector appeared heading for a boom. From that year, the companies were surviving on buying foreign currency from the expensive parallel market. This development had an impact on the information quality, system usage, user satisfaction as well as the company’s net benefits.

Between 1997 and 2008 Zimbabwe’s information technology sector that was expected to boost production in the manufacturing sector, declined at a fast rate and it faced possible collapse due to the acute shortage of foreign currency and excessive loss of skilled manpower. However Information Communication Technology (ICT) investment levels had risen rapidly in the communication sector. The Zimbabwe tele-density rose to 78.8% during 2012 first quarter from 67.5% in 2011. In the manufacturing sector, the investment was at a very slow pace and as a result many companies continued to use semi-automated production systems.

The government, in 2009, introduced multicurrency in an attempt to alleviate economic problems. This had little impact on raising production levels for the period 2009 to 2014. The measurement of the impact of information quality was critical to the understanding of the value and efficacy of information systems (IS) management processes and IS investments. Some models were developed to measure the impact of IS on individual worker and company benefits in developed countries. The Delone and McLean IS success model (2003) was developed and is used as a framework in this study.

The impact of the information quality had not been measured in the Zimbabwean manufacturing sector. Without any model in place, there would be little or no understanding of the relationships between information quality, systems usage, user satisfaction and net benefits on the companies.

II. Statement of the Problem

As already discussed in the background, the Zimbabwean manufacturing sector had performed below capacity since 1997 and most of the companies operated semi-automated production machines. The impact of information quality has not been measured. Currently there is a little understanding of how information quality is related to the company production activities.

III. Literature Review

In 2003 DeLone and McLean came up with a model that showed the impact of information quality on the company performance. The DeLone and McLean information systems (IS) success model (2003) is illustrated below.

![Figure 1: The DeLone and McLean IS success model (2003)](image-url)
In this model the dimensions of success included the following constructs:

- **Information quality** – The desirable characteristics included system outputs like management reports, relevance, understandability, accuracy, conciseness, completeness, timeliness and usability.

- **System use** – The degree and manner in which staff and customers made use the capacities of an information system, for example, amount of use, frequency of use, nature of use, extent of use and purpose of use.

- **User satisfaction** – Users’ level of satisfaction with reports, IT department’s support services.

- **Net benefits** – The extent to which information quality is contributing to the success of individuals, groups, companies, industries and nations, for example, improved decision-making, improved productivity, increased sales, cost reductions, increased profits, job creation and economic development.

Many studies were carried out to verify this model. For example, DeLone and McLean (2004) applied their model in an e-commerce environment. Two cases were used. The first one was the Barnes and Noble’s online book sales. The book buyers would find it easy to access the site and would be available any time. Information searched would be relevant and readily available and also complete. A fast email response to purchase transaction would be an online service quality. A call-centre was made available for any queries. A number of visits by customers would be used to measure system usage and customer satisfaction would be shown by repeated purchases. All these explanations showed how the updated DeLone and McLean model was applied in e-commerce. The second case was a quality consumer electronic retail shop. It had a website that sold audio and video brands of high quality. The company faced challenges from large electronic retailers with e-commerce sites. The company then decided to implement an electronic customer-relationship management in the e-commerce context. The accrued benefits would be realized if customers were satisfied with the site. Customers were requested to fill and return email customer satisfaction questionnaire that measured the quality shown by the downloading speed and site’s ease of use, information relevance, response speed and customers’ satisfaction. All these revealed how the DeLone and McLean IS success model was applied in a different e-commerce situation.

Lin (2005) presented a re-specification of the DeLone and McLean IS success model and that empirically examined it in the enterprise resource planning (ERP) context. The IS model was tested using a survey of 257 companies that had already implemented ERP systems in Taiwan. Results of the study confirmed and were found to be consistent with the IS success factors for explaining ERP systems success. Information quality had a significant impact on system use and user satisfaction. System use and user satisfaction were found to have an association with individual impact. Information quality played a major role on the utilisation of ERP and users’ satisfaction. In addition, system use and user satisfaction had an influence on individual performance and productivity.

Almutain and Subramanian (2005) carried out an empirical application of the DeLone and McLean model (1992). Seven organisations were selected from seven sectors. The organisations were listed on the Kuwaiti stock market. Simple random sampling was performed to come up with the sample. The selected seven agreed to be part of the research. The respondents were selected from employees using
information systems. Two hundred and fifty employees were considered for the research. Data on information quality, system usage, user satisfaction and individual impact determinants were collected from end-users. The results showed that information quality had an effect on user satisfaction. System usage also had an effect on individual impact.

Lui and Lee (2006)\(^7\) used the updated DeLone and McLean information systems success model (2003) as a theoretical framework. They developed a model that could be used successfully online by communities in Taiwan. The researchers used a questionnaire for data collection. Information quality had an impact on member loyalty through user satisfaction and intention to use the system.

Bradley et al (2006)\(^8\) carried out an empirical investigation on the DeLone and McLean model in the context of different corporate culture types. In their study the researcher took into consideration information technology plan quality, a contingency factor, company culture type and variations of IS use. They justified the inclusion of IT plan since it assisted in establishing standards that affected system connectivity, compatibility as well as hardware, software and data modularity in any company. The results revealed that a high quality information technology plan produced system success.

Wu and Wang (2006)\(^9\) carried out a study to evaluate the DeLone and McLean model in Taiwan. Their findings raised an important issue of establishing a measurement model that could be used to evaluate knowledge management system (KMS) success and suggested ways to improve its usage. The empirical results of the study indicated that knowledge or information quality had a significantly positive influence on user satisfaction. In addition, user satisfaction and perceived KMS benefits had a direct effect on KMS use.

Hsieh & Wang, (2007 cited by Urbach et al 2008\(^{10}\)) concluded in their study that perceived ease of use showed a significant relationship to user satisfaction. A study of knowledge–management systems found that information quality had a significant relationship to the user’s intention to use (Halawi et al. 2007 cited by Petter et al 2008\(^{11}\)). McGill et al. (2003) and Iivari (2005 cited by Petter et al 2008\(^{11}\)) carried out studies that showed that information quality was not significantly related to the user’s intention to use the system. At the company level, Fitzgerald & Russo (2005 cited by Petter et al 2008\(^{11}\)) in their research study, found a positive relationship between information quality and system use.

The relationship between information quality and user satisfaction had a strong support in the research literature. Some of the researchers who supported this view were Iivari (2005 cited by Petter et al 2008\(^{11}\)) and Wu & Wang (2006)\(^9\). Research studies found a consistent relationship between information quality and user satisfaction for the individual worker as shown by McGill et al. (2003 cited by Petter et al 2008\(^{11}\), Almutain & Subramanian (2005), Wixom & Todd (2005), Kulkarni et al. (2006), Chiu et al. (2007), and Halawi et al. (2007). All these researcher were cited by Petter et al 2008\(^{11}\).

Researchers also found a moderate support for the positive impact of information quality on individual worker’s performance. Information quality was found to influence the quality of work and also time savings (Shih, 2004)\(^{12}\) as well as decision-making processes (Bhakati and Chandhury, 2006 cited by Petter et al 2008\(^{15}\)). Shih (2004)\(^{12}\) and Wu & Wang (2006)\(^9\) in their studies concluded that information quality had a significant influence on the perceived usefulness and company net benefits. Kositanurit et al (2006 cited by Petter et al 2008\(^{11}\)) discovered significant relationship between information quality and performance among users. In knowledge management system, system content quality had no
direct relationship with perceived usefulness as found by Kulkarni et al. (2006 cited by Petter et al 2008[1]). Bradley et al. (2006)[8] also studied information quality and the impact of the system in formal and entrepreneurial companies and found non-significant results between the two variables. A case study performed by Leclercq (2007 cited by Petter et al 2008)[11] showed the relationship between the function of information systems and the users as well as the quality of support and services provided by the IS function had a positive impact on user satisfaction. The understanding between the IS department and the users had no significance on satisfaction of the system (Marble, 2003 cited by Petter et al 2008[11]).

In knowledge-management systems, Halawi et al. (2007)[13] identified a significant relationship between intention to use and user satisfaction. This was supported by Chiu et al. (2007 cited by Petter et al 2008[11])’s findings in e-learning processes. Iivari (2005 cited by Petter et al 2008[11]), in a study of medical information system during which use was mandatory, found that use was significantly related to the user’s satisfaction. Many studies carried out by Almutain & Subramanian (2005)[6] and Kositanurit et al. (2006 cited by Petter et al 2008[11]) among other researchers found significant relationships and correlations between system use and net benefit. User satisfaction was strongly related to use when measured by system dependence (Kulkarni et al. 2006 cited by Petter et al 2008[11]). It was also found to be the same, when the researchers considered the number of applications and tasks for which the information system was used. There was strong support for the relationship between net benefits and user satisfaction. Studies by Kulkarni et al (2006 cited by Petter et al 2008[11]) and Hsieh and Wang (2007 cited by Urbach et al 2008[10]) came up with a positive significance between net benefits and user satisfaction. Khayun (2012)[14] researched on the e-excise tax success factors using the IS model as the framework. The research identified the relationships between the DeLone and McLean IS model, trust in e-excise system and individual characteristics. The results showed that quality of information perceptions had an influence on system usage and user satisfaction and resulted into perceived benefits.

Kim et al (2012)[15] carried out an assessment of the effects of course management systems on the benefits of e-learning systems in higher education settings. They used DeLone and McLean information systems success model as their theoretical framework. The data analysis revealed that information quality and instructional quality had a positive impact on user satisfaction which then influenced course management systems by increasing its benefits.

IV. Research Design and Methodology

Qualitative research paradigm was used. The qualitative paradigm was selected as it provided rich detailed accounts of the employee experiences on production systems quality in the Zimbabwean manufacturing sector. The researcher sought to understand the problem from the perspectives of the local experts involved in the field of production. A phenomenology research approach was preferred as it captured the views and experiences of the participants on the required data. The targeted population was manufacturing companies that had semi-automated production activities. Purposive sampling was employed to come up with a sample of 19 companies of which 12 expressed interest in participating in the study. The researcher used interviews, observations, documentary analysis, open-ended questionnaires as data generation tools. Triangulation was used to integrate data from different data collection methods.
V. Results and Discussions

The results showed that the semi automated production systems did not provide information but generated data. The data did not contribute meaningfully to the production processes. The data required processing into useful information using separate systems. The produced information was rated by the participants as not very accurate as errors occurred during data transfers to the processing systems. The data generated from the systems were inputted and processed in such systems as the SAG and System Pro. The participants were of the same opinion that the resultant information from these sub-systems was useful and logical although there was some delay in its processing. The information was said to be relevant, adequate and complete but was not readily available due to the above delays. The impact of information quality on usage was moderate. This confirmed findings by Fitzgerald & Russo (2005 cited by Petter et al 2008).

Generated and processed data revealed that the users of the semi-automated systems were not very much satisfied with the quality of data that could not be readily used as they needed further processing into useful information. The data were not easily retrieved and this caused dissatisfaction among the employees who experienced some production delays as decisions were not made instantly. This resulted in low impact of information quality on the users. This was contrary to what other researches on ERP systems (Lin 2005, Wu and Wang 2006, Almutain and Subramanian 2005) found out.

Data indicated that the semi-automated systems were affected by the non availability of online information that delayed completion of production processes. The information quality did not positively contribute to the work quality which in turn affected labour productivity. The data also revealed that the participants of the semi-automated systems experienced some delays in the production of reports required for decision making by management. This had a negative impact on the on the production process. This was also contrary to what other authors found out (Lin 2005, Almutain and Subramanian 2005, Wu and Wang 2006).

The information quality also had an indirect effect on the user, system usage and company benefits. The semi-automated production systems generated data and not information. The data were not useful to participants so it had to be processed into useful information, hence the low impact. The researchers of ERP systems concluded that there was a positive impact on user satisfaction, usage and benefits (Lin 2005, Wu and Wang 2006, Kositanurit et al. 2006 cited by Petter et al 2008).

The system usage had very little influence on the user satisfaction. Those working on the semi-automated machines experienced some insignificant satisfaction due to the delays exposed by the systems. The little impact came from the semi-automated section of production. The system usage had little influence on the company benefits because there was no production increments recorded. Halawi et al. (2007) and Chiu et al. (2007 cited by Petter et al 2008) found opposite results.

The user satisfaction on company benefits was affected by the fact that some of the production activities required human intervention. Production was not continuous as workers had set working hours. This resulted into reduced productivity and the companies then failed to get the required benefits from user satisfaction. In ERP systems user satisfaction was found to benefit the companies (Kulkarni et al 2006 cited by Petter et al 2008 and Hsieh & Wang 2007 cited by Urbach et al 2008).

The results can be summarized in the diagram below.
It can be conclude that the Zimbabwean manufacturing sector still have a long way to go in improving its production systems.

**VI. Research Findings**

The use of computers was not directly significant to the production processes as computers processed other company functions such as accounting, sales and marketing that passed on information to the production systems through hard copies. A delay in decision-making was experienced in the production process leading to reduced profits.

The data analysis also revealed that a technology gap existed between the Zimbabwean manufacturing systems and ERP systems in developed country and some part of Asia. It showed that the Zimbabwean manufacturing processes had mixed operations involving both manual and semi-automated systems that raised the production costs and compromised the product quality that could not break into new international markets. The products could not compete with those produced by the ERP systems that had seamless and instant production operations as shown by the researchers cited in the literature review above.

**VII. Conclusion**

Despite of economic problems in the country, the Zimbabwean manufacturing sector had production systems in operation. Systems were operating independently under the same company. The model suggested above illustrated the situation. The semi-automated systems operated with a number of challenges that retarded growth in productivity. Government investment policy required some improvement in order to attract foreign investments that could bring in some integrated systems in order for the manufacturing sector to compete at the international level.

**VIII. Recommendations**

The Zimbabwean companies were implementing their systems in a piece meal fashion that made integration difficult and expensive due to the non-compatibility of systems. Companies need to be educated on the effects of integrated systems on the company benefits.

Lastly there is an urgent need to develop partnership between universities’ IT departments and the industry. The universities could be centres of software development that could be used by the industry. Government could grant universities licenses for their software as a motivating factor. This had been applied in many countries as revealed by some studies (Garza 2007 and Edington 2008).

**IX. References**


