

**An Assessment of the Level of Technological Adoption in Manufacturing Industries: The Case
Study of (A To Z) Textile Mills Limited, Arusha**

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ABSTRACT

This study assessed the level of technological adoption in manufacturing industries, the case of A to Z Textile Mills Limited, Arusha. Three specific objectives guided the study: to identify the major obstacles facing manufacturing industries in adopting technological levels, to appraise the theoretical bases and principles to be used to level up or promote the level of technology, and to determine the factors limiting exporting products manufactured by the adopted industrial technological level. A descriptive research design was employed to collect primary data using questionnaires and interview from actual sample of 97 respondents who involved the A To Z industry management and surrounding customers. Data from questionnaires were analyzed in frequency and percentages, while data from the interview was analyzed using content analysis. The study revealed that, the developing manufacturing industries faces various challenges that the absence of strong department to deal with research and development, lack of focus to deliver quality products to consumers and depending on outsourcing experts from outside the industry. The study found that, regardless of the manufacturing industry management to face the challenges in adopting new technologies, there are possible measures which can help to level up the technology including hiring qualified and competent employees, focusing on producing high quality products, management adherence to the adoption phases ensuring that all the required adoption steps are followed and adhered. Further, most of home industries are limited to export products due to failure to meet the International Standards Organization (ISO) guidelines, producing to meet domestic demand and the existence of high competition in the world market. The study concluded that, the study revealed that when a manufacturing industry is planning to focus on quality issues it will make sure that quality technology are adopted. This assures the manufacturer to meet the intended quality of the products which are to be supplied to customers. Always customers need high quality products which are able to satisfy their needs. The study recommended that, the management is required to develop or strengthen the research and development department with qualified experts who are able to help the industry know which technology to be adopted, when to adopt technology, how to adopt and where to adopt. This will lead to the increase in awareness by determining the available strengths, weaknesses, opportunities and threats so as to take appropriate actions to achieve the intended goals.

Key words: *Technological Adoption, Manufacturing Industries*

INTRODUCTION

Manufacturing is the backbone of the world economies whereby, changing in demography, globalization, scarcity of resources, the challenges of climate change, and mass customization are the megatrends challenges the future of manufacturing these changes imply volatile, uncertain, complex, and ambiguous environments for firms and affect them across their strategic environment. Firms are to still up to date with new technologies so that to remain competitive to the market. Various initiatives emphasized the urgency for advanced manufacturing strategies to tackle those challenges and support economic growth (UN, 2018).

The United Nations Report (2015) on export competitiveness and development in LDCs, policies, issues and priorities for least developed countries, found that, it is only one aspect of the capabilities needed for the exploitation of new technologies. Also, managerial competency is generic core and fundamental skills that is complementary to new technologies such as literacy, numeracy, and basic academic skills together with basic financial and entrepreneurial skills and, increasingly, basic digital and even coding skills. The study recommended that, the internet access is critical when adopting new technologies especially in manufacturing industries, hence it is significant to have own skilled internet experts. The World Bank in 2020 declared Tanzania as among countries that have entered the middle economy. These success are related to the fifth president the late Dr. Joseph John Pombe Magufuli who came with the policy of "TANZANIA YA VIWANDA", hence the policy has succeeded (World Bank Group, 2020).

Kweka (2018) argue that, industrialization has been the main policy agenda for the 5th Phase Government, and is considered pivotal to realizing Tanzania's ambition to become a middle-income economy by 2025. The industrialization drive is consistent with the literature, which puts industrialization at the center of technological transformation, economic transformation, jobs, and development. Manufacturing is the core sub-sector driving industrialization in most countries while also determining the long-run sustainability of an economy. Put the gap here that influences you to do a study.

LITERATURE REVIEW

Theoretical Literature Review

Technology Acceptance Theory

The Technology Acceptance Theory was developed by Davis, 1989 presenting the perceived usefulness and perceived ease of use as, perceived usefulness is the degree to which a person believes that using system would enhance his or her job performance especially in production. Perceived ease of use is the degree to which a person believes that using a particular system would be free of effort (Sophonthumm 2008).

Since Technological Acceptance theory has been introduced, it has been the most influential and widely used model in predicting and explaining the usage behavior of technology related products/services. Nevertheless, it has been criticized for possible limitations since it emphasizes only the effect of technology. In fact, the behavioral intention of individuals is also influenced by other things surrounding them.

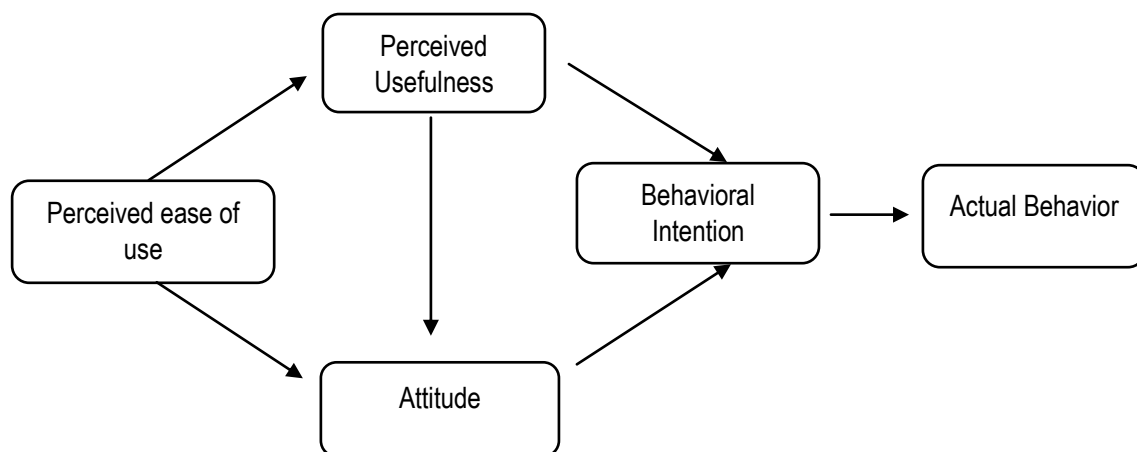


Figure 1: Technology Acceptance Theory

The theory is attractive to support this study, as in developing countries there is highly need to review the models that used in technological adoption especially in industrialized countries in the world. It clearly showing a good flow from perceived ease of use that determine the attitude of use that depends from perceived usefulness. Thereafter, the output is symbolized by behavioral intention (the intended output), thereafter, actual behavior symbolizes the actual use of the property (machine), it describes a certain level of performance.

Empirical Literature Review

The study conducted by Kumlachew (2015) on technological adoption of Ethiopian manufacturing firms in Africa. The study used descriptive study design and qualitative approach to study main objective of the study that was to identify associated risks when adopting new technology where the primary data collected from 180 respondents who selected randomly. The study found that, before any financial commitment and budget is made, there should be reasoning on variety of the factors. It was recommended that, the management should think where to adopt technology, who are experts/consultants will be involved in adoption, the cost of the technology and what is its performance capability. This is since, technological adoption adds value in the company's assets and increase profitability of the firm.

The study conducted by Koski (2019) on achieving competitive advantage by being an early adopter. The study used a descriptive study design by adopting a documentary review data from six different supply chain professionals combined with existing literature. The study found that, early technological adoption in any manufacturing environment plays an important role in improving operational functions due to the reason that it comes with revolutions in production area. It creates improves performance of the industry hence building competitive advantage, hence encouraging customers' satisfaction. The study recommended that, for any implementation of strategic technological investment plans, companies are to fight to be among of the early adopters of that technology to be aware on the weakness and competency of that technology a factor that will help them remain competitive in the industry.

The study conducted by Diaconu (2017) on technological innovation on the concept, process, typology and implications in the economy with the objective to find out measures to be applied when adopting new technologies especially in production areas. The study applied the case study design that

employed questionnaires and interviews to present qualitative results of the study. The study found that, it is very influential for the manufacturing industries to ensure that the technological adoption plans start with main idea of focusing on conducting researches which are helpful to adopt the right technology. Therefore, the study recommended that manufacturing industry to adopt the technology innovation strategy so as they will be able to determine what products quality are demanded by customers, so that they will be able to adopt the technology that is able to meet current demand.

The study conducted by Signé (2018) on the evolution and prospects of manufacturing and industrialization in Africa. The study found that, manufacturing sectors in Africa is broadly understood as a fundamental path to economic growth and development, but still the challenge is how to invest on industries. The most recent illustration is the launch of the African Continental Free Trade Area (AfCFTA) in March 2018, a single market for goods and services in Africa that aims to unlock manufacturing potential and facilitate industrialization, driving sustainable growth and jobs among other objectives. The study concluded that, African manufacturers need to innovate new technologies as developed countries did to make differentiation. It was recommended that, imitation of developed product design should be swept out, new innovated designs in Africa are needed.

The study conducted by Mwabukojo (2020) on assessing the applicability of technology transfer approach as the strategy to enhance technology advancement in Tanzania. The study based on descriptive design. It was found that, despite technology capacity being low in Tanzania, technology transfer strategy is limited applied in the country. Inadequacy of political will, lack of adequate of technology transfer institutions and lack of readiness be among the main factors that had hindered the applicability of technology transfer approach in Tanzania. Even though technology transfer approach is not adequately applied in Tanzania, the strategy is still potential not only in Tanzania but in the Sub Sahara African region. Since, least developed countries are in advantage position to access technologies from the rich countries, it will be a mistake to continue to ignore the strategy even though the approach is proven to be profitable. The study recommended for the manufacturers to conduct research and design to know well where to start in technology adoption.

Research Gap

However, technological adoption in manufacturing industry plays a vital role in increasing productivity performance, the level of the technology that is adopted by developing countries manufacturing industries differ with that technology adopted by manufacturers from developed countries. The main factor becomes that, most of developing countries manufacturers have limited capitals which are compelled to invest on large technologies. Unfortunately, even the low technology that is adopted in little qualifies the international standards organization (ISO), hence they are producing for consumption, in little for export. The study succeeded to bridge the knowledge gap left by assessing on the level of technological adoption in manufacturing industries performance in Tanzania.

Conceptual Framework

The conceptual framework for the study developed by relying on the three specific objectives focuses on essential concepts on which data collection and analysis based.

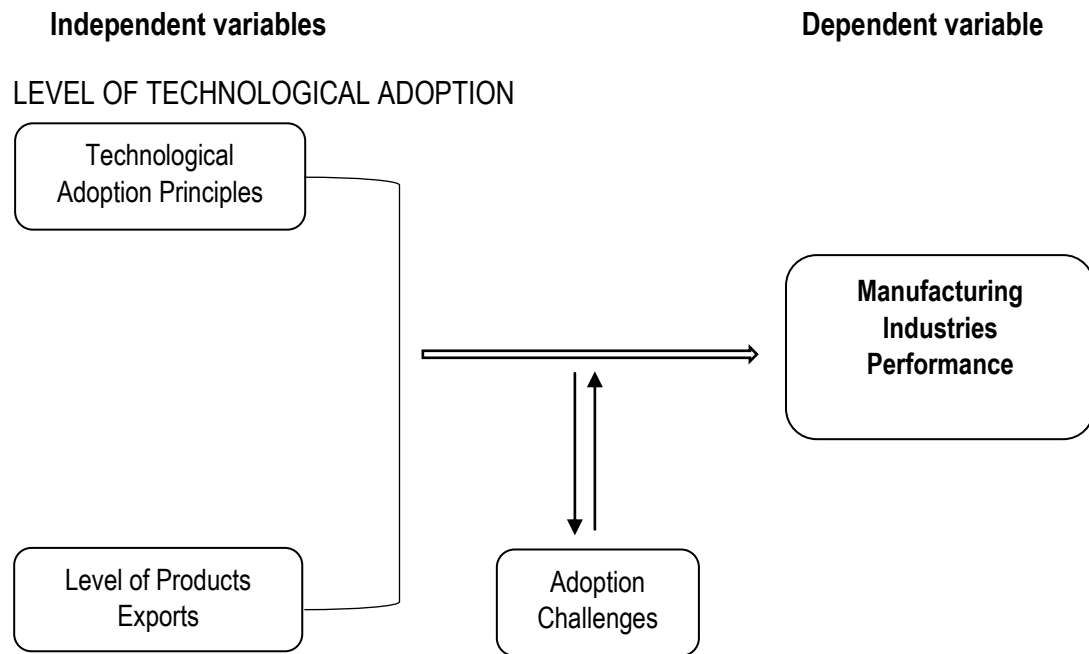


Figure 2: Conceptual framework

Relationship of the Variables to the Study

Figure 2 above represents two elements that forms the basis of the study as influencing on the assessment the level of technological adoption in manufacturing industries performance in Tanzania. The figure presents two conceptual variables, moving from left are the independent variables and the right variable is dependent. Independent variables include the factors symbolizing the level of technological adoption in enhancing manufacturing industries performance. From the conceptual framework, the manufacturing industry should first study on the challenges which may risk the adoption process, secondly, how a certain technology should be adopted. Thereafter, how that adopted technology will help to produce quality products which are meet export standards. The dependent variable "Manufacturing Industries Performance" shows the output of independent variables that will be obtained.

METHODOLOGY

Study Area

The study conducted in Arusha region, the case of A to Z Textile Mills Limited, Arusha. The study area had adequate number of potential and actual populations who provided an adequate data and information to the researcher about the study, further the researcher selected this area due to expectations that this manufacturing industry adopts variety of technologies interchangeably.

Research Design

The study adopted a descriptive design, basing on the analysis of this study, an explanatory approach was used. According to Kothari (2006) descriptive research design aims at attempt to collect quantifiable information to be used for statistical analysis of the population sample, it allows to collect and describe the nature of the demographic segment. The study approaches was quantitative and qualitative.

Study Population

For the purpose of this study, the population was grouped into three categories which are; from manufacturing industry management team who comprised a total of at least 121 individuals from A to Z Textile Mills Limited, Arusha. The study further involved 35 consumers who are surrounding A To Z manufacturing industry. This let the total population for the study to comprise 156 personnel's to be used to obtain the study sample size.

Sampling Techniques

For this study, both simple random and non-probability sampling techniques were undertaken to choose sample elements. A simple random sampling technique was employed to select customer's respondents while non-probability used to select sample from employee's depending on their responsibilities in industries.

Data Collection Methods

In order to enable researcher to attain research objectives to a sound level, both primary and secondary data was collected relating with this study. Primary data collected directly from respondents while secondary data obtained from various documents talking about technology adoption in manufacturing industries.

Interview

This method was used to gather data from customers' who responded depending on the researchers' structured interview on the level of technological adoption in manufacturing industries.

Questionnaires

This study employed structured questionnaires as a tool of gathering relevant data and information from the study area. The closed-ended questions were designed in a Likert-scale to provide several alternative answers by which a respondent required to rate depending on their views.

Documentary Review

These information's were obtained from various sources including Google Scholar, Science Direct and Research Gate in order to gather more information about the study. So the researcher used different documents in order to access accurate and reliable data.

Data Analysis Methods

The researcher used quantitative data from manufacturer employees to conduct analysis for the study. The quantitative data from direct respondents was analysed by using statistical package for social science (IBM SPSS) software, version_25.0. The findings from the descriptive part of this study organized and presented in the form of words, numbers, and percentages using charts and tables where necessary and applicable. Further, for the qualitative data, the researcher used content analysis to analyse the concepts and views presented by informants so as to reach conclusion of the study. The data were presented in form of discussions considering the comparisons and differentiation of ideas to reduce repetitiveness of ideas from informants.

Ethical Consideration

The researcher considered every requirement of research ethics to establish trust with the participants and to respect them independently, thus enabling them to make sound decisions to the data collection tools. Ethical measures were important in ensuring the validity and reliability of data collection. Other ethics considered informant consent, confidentiality, privacy, dissemination of results, by ensuring the information which provided by respondents was useful in research purpose only and the respondents had the right to withdraw from the study partially or completely. This study taken into consideration ethical all the rules according to the Institute of Accountancy Arusha (IAA) guidelines of conducting research.

FINDINGS

Table 1: The major obstacles facing manufacturing industries in adopting technological levels

SN	Obstacles in adopting technological levels	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Budget constraints	3 (3.8)	4(5.1)	5(6.3)	31(39.3)	36(45.6)
2	Limited research and development	7(8.9)	11(13.9)	2(2.5)	29(36.7)	30(37.9)
3	Inadequate technical consultation	13(16.5)	15(19.0)	2(2.5)	30(38.0)	19(24.1)
4	Failure in value chain focus	12(15.2)	10(12.7)	4(5.1)	21(26.6)	32(40.5)
5	Failure in managing associated risks	15(19.0)	6(7.6)	7(8.9)	23(29.1)	28(35.4)
6	Personnel's expertise dependency	21(26.6)	12(15.2)	5(6.3)	25(31.6)	16(20.3)
7	High technological dependence level	10(12.7)	8(10.1)	1(1.3)	36(45.6)	24(30.4)

Source: Field Data, (2021)

Research findings of this study shows that 84.9% of total respondents agreed that budget constraints is the major obstacles facing manufacturing industries in adopting technological levels, 74.6% responded that limited research and development is the is the major obstacles facing manufacturing industries in adopting technological levels. Lastly, the respondents with 76.0% agreed with the statement that high technological dependence level is among the major obstacles facing manufacturing industries in adopting technological levels.

Table 2: Theoretical bases and principles which can be used to level up or promote the level of technology adoption in manufacturing industries

	Principles to promote level of technology adoption	1	2	3	4	5
1	Strengthening managerial competency	17(21.5)	16(20.3)	3(3.8)	27(34.2)	16(20.3)
2	Investing in first hand (new) machines	5(6.3)	7(8.9)	2(2.5)	26(32.9)	39(49.4)
3	Focusing on quality issues	4(5.1)	8(10.1)	4(5.1)	22(27.8)	41(51.9)
4	Innovating in-house technology	11(13.9)	9(11.4)	5(6.3)	23(29.1)	31(39.2)
5	Adhering to the adoption phases	9(11.4)	15(19.0)	2(2.5)	22(27.8)	31(39.2)

Source: Field Data, (2021)

The respondents with 82.3% of the total respondents agreed that investing in first hand (new) machines is among the best theoretical bases and principles which can be used to level up or promote the level of technology adoption in manufacturing industries. The study found that the respondents with 79.7% agreed with the statement that, focusing on quality issues is among the best theoretical bases and

principles which can be used to level up or promote the level of technology adoption in manufacturing industries.

Table 3: The factors limiting exporting products manufactured by the adopted industrial technological level

S/N	The obstacles limiting exporting products	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Production of low quality products	0(0.0)	7(8.9)	2(2.5)	34(43.0)	36(45.6)
2	Failure to meet the ISO standards	12(15.2)	3(3.8)	5(6.3)	32(40.5)	27(34.2)
3	Less production (for domestic use)	5(6.3)	9(11.4)	4(5.1)	28(35.4)	33(41.8)
4	High competition in the world market	4(5.1)	5(6.3)	2(2.5)	27(34.2)	41(51.9)
5	High production cost	7(8.9)	1(1.3)	9(14.4)	34(43.0)	28(35.4)

Source: Field Data, (2021)

The research findings indicate that the respondents with 88.6% agreed with the statement that, production of low quality products is among the factors limiting exporting products manufactured by the adopted industrial technological level. The respondents agreed with 86.1% that high competition in the world market is among the factors limiting exporting products manufactured by the adopted industrial technological level.

DISCUSSION OF FINDINGS

The study revealed that among the major obstacles facing manufacturing industries in adopting technological levels is budget constraints. This implies that, adopting new technologies especially to the developing manufacturing industries are of high costs including importation costs as at large technologies are acquired from developed countries. There are two factors which face a manufacturing industry to lack this whether there is no much budget to invest on research and development department or the management is not aware on the benefits of research and development. It is very important for a manufacturing to hire special consultants who are responsible to help the manufacturing industries adopt quality technologies. The findings revealed that before a manufacturing industry to adopt any technology, it is very important to plan strategically on which the product value are to be supplied to customers. This will help offering quality products to the quality and avoid competition from other competitors. In order for manufacturing industry in order to survive in sustainable way should ensure has in-house technological experts rather than depending supports from outside the operations.

The findings revealed that, strengthening managerial competency is among the theoretical bases and principles which can be used to level up or promote the level of technology adoption in manufacturing industries. When manufacturing industries are able to employ competent managerial team, they are in a right way to improve the level of technology. By adopting first-hand or new machines all the planned production phases to be produced are able to be completed timely. This assures the ability to meet the available demands from customers, hence meeting their satisfaction level becomes inevitable. There is a point to note that, the matter is not to produce enough products to meet demands, also manufacturers are encouraged to produce quality products which meet buyer’s needs. In order to level up or improve the level of technology, it is very essential for the management to ensure that all steps which are required for adoption are adhered starting from advertising the tender, selecting the supplier and delivery of the technology. This may consider the type of acquisition if is by competitive or single source.

The findings revealed that, production of low quality products is among factors limiting exporting products manufactured by the adopted industrial technological level. The International Standards

Organizations already have acceptable qualities which are allowed for export to other countries especially to the developed countries. This provides the manufacturing industries to ensure they are able to adopt technologies which are helpful to produce for international market. Some of the manufacturers especially in the developing countries are limited with supply scope. They are planning to feed internal or domestic markets. Currently the world market is highly competitive hence it accepts only the products produced under high technology. This alerts all strategic manufacturers especially which are fighting to sell their products in the world market to ensure that they adopt quality and highest technologies to achieve this goal, failure to align with this factor it will be impossible.

CONCLUSION

The developing manufacturing industries faces various challenges which are out of their budget especially when they need to adopt new technologies. Adopting new and highest technologies require enough budget so as to increase productivity and quality of the products. Absence of strong department to deal with research and development on manufacturing technology is harmful for the management, there is high need to strengthen this department so as to help in the mentioned matters. They are helpful to advice the management on when, where and how to hire right consultants for the certain technology. A manufacturing industry may limit itself to adopt the right technology due to lack of focus to deliver quality products to consumers. The study found that, regardless of the manufacturing industry management to face the challenges in adopting new technologies, there are possible measures which can help to level up the technology. By hiring qualified and competent employees, they are able to advice management on which are the best technologies to be adopted. Every manufacturing industry wish her products to be exported to the potential markets which can be the source of maximizing the profit. The study revealed that, the manufacturing industries especially in the developing countries like Tanzania, they are limited with failure to produce the needed quality by the customers internationally. The products which are required for export are those which meet the International Standards Organization (ISO) guidelines. These limitations lead to variety of manufacturing industries produce to serve their domestic markets. The world markets have high competition from big manufacturers a factor leading to the products demanded to be of high quality. The study found that another factor limiting exportation from most of manufacturers are producing the products under high costs, due to the use of poor technologies hence fails to compete with large manufacturers. This alerts manufacturers to adopt highest technologies and reduce the use of outdated systems.

RECOMMENDATIONS

The management of A To Z Textile Mills Limited are required to ensure there is the chance to employ qualified and competent employees so as to come up with changes on which are the best technologies to be adopted. They will help the manufacturing industry to reach its planned goals timely.

The management is required to develop or strengthen the research and development department with qualified experts who are able to help the industry know which technology to be adopted, when to adopt technology, how to adopt and where to adopt. This will lead to the increase in awareness by determining the available strengths, weaknesses, opportunities and threats so as to take appropriate actions to achieve the intended goals.

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