



**Sudan University of Science and Technology**



**College of Graduate Studies**

**The possibility of Applying Quality Management System**

**(ISO 9001-2015) On Business Incubators**

**(Case study: Business Incubators at Africa City of Technology (ACT))**

**امكانية تطبيق نظام إدارة الجودة لحاضنات الاعمال ( ايزو 9001-2015)**

**(دراسة حالة: حاضنات الاعمال بمدينة افريقيا التكنولوجية)**

A Dissertation Submitted to Sudan University of Science and Technology in the Partial  
Fulfillment of Requirements for the M.Sc. Degree in Total Quality Management and  
Excellence

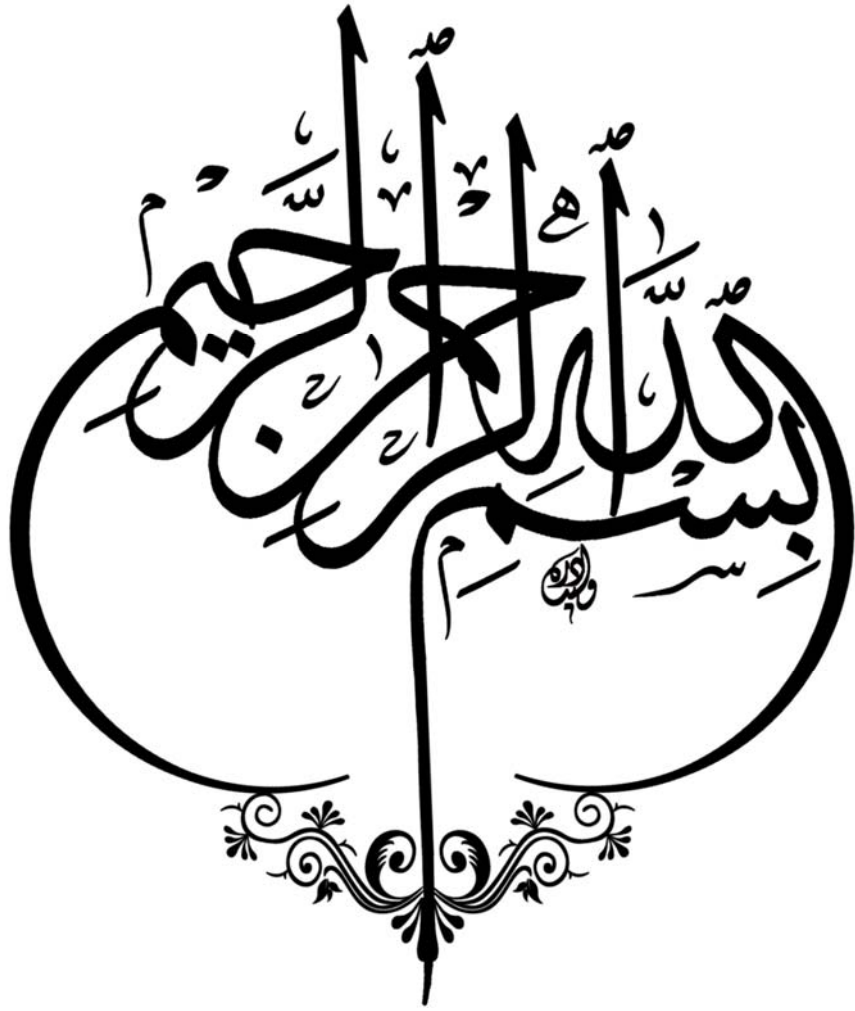
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**2020**



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَقُلِ اَعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ اِلَىٰ عِلْمِ  
الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُونَ

صدق الله العظيم

(سورة التوبة: 105)

## **Dedication**

I dedicate this to my mother, father, brothers and my only sister, who gave me love, support and trust, as well as to my husband who did not get tired of push and supported me.

## **Acknowledgement**

Praise be to God, Lord of the worlds, and blessings and peace be upon the best of the messengers of the Messenger Muhammad and his family and companions: - Praise be to God first and foremost for the merit of completing this study.

Special thanks to Sudan University of Science and Technology and the Deanship of Development and Quality for giving me this opportunity to study and obtain a master's degree, I would like to acknowledge the contribution of my principal supervisor, Dr. Abdel Moneim Bashir, who guided and encouraged me, as well as questioned my question and gave me more advice.

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Finally, I wish to express my gratitude and love to my parents for their unreserved Love, support and encouragement. The courage and determination they taught me have made my life so wonderful.

## **Abstract:**

The aim of this study is investigate the applicability of the quality management system in ACT business incubators, and the scope of the study was in the Africa City of Technology business incubators.

The study focus on the incubators in Sudan in general are not implementing Quality Management System, especially ACT Business incubators.

The study used an analytical, descriptive and statistical approach to calculate the assumptions of statistical significance in the analysis of the questionnaire, which was distributed to a random sample of members of the business incubators and after analysis of the results showed that there are statistically significant for the possibility of applying quality management system (ISO 9001-2015) in business incubators at ACT

The most important findings of the study that Africa city of technology business incubators has the possibility and readiness to apply the quality management system (ISO 9001- 2015).

The results of the study revealed support the possibility of applying Quality Management System (ISO 9001-2015) in business incubators Case study: Business incubators at Africa City of Technology (ACT), according to the validity of the hypotheses that have been developed.

The research recommended the continuation of training and awareness of employees regarding the implementation of the QMS ISO 9001-2015

## مستخلص البحث :

الهدف الرئيسي لهذا البحث هو دراسة قياس امكانية تطبيق نظام ادارة الجودة (ايزو 9001-2015) في حاضنات الاعمال في مدينة افريقيا.

تركز الدراسة علي ان الحاضنات في السودان بشكل عام غير مطبقة لنظام ادارة الجودة و بشكل خاص حاضنات مدينة افريقيا التكنولوجية.

استخدم البحث نظام التحليل الاحصائي لحساب الفروض ذات الدلالة الاحصائية في تحليل الاستبانة التي وزعت علي عينة عشوائية لإفراد من الحاضنات وبعد التحليل اظهرت النتائج وان هنالك دلالة احصائية لامكانية تطبيق نظام ادارة الجودة في حاضنات الاعمال (ايزو 9001-2015) في مدينة افريقيا.

نتائج الدراسة كشفت عن دعم امكانية تطبيق نظام ادارة الجودة (ايزو 9001-2015) في حاضنات الاعمال

دراسة حالة: حاضنات الاعمال في مدينة افريقيا للتكنولوجيا (ACT) , و وفقا لصحة الفرضيات التي تم تطويرها.

اهم نتائج الدراسة هي ان حاضنات الاعمال في مدينة افريقيا التكنولوجية لديها القدرة والاستعداد لتطبيق نظام ادارة الجودة (ايزو 9001-2015).

ويوصى البحث أن يتم مواصلة التدريب و التوعية للموظفين فيما يخص تطبيق نظام ادارة الجودة (ايزو 9001-2015) و المضي قدما في تطبيق النظام.

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### Abbreviations

ACT: Africa City of Tecthnology

TBI : Tecthnology Business Incubator

**CHAPTER ONE**  
**INTRODUCTION**

## **1.1 Study background**

Incubators an important opportunity to rise the economics of Sudan by provide suitable circumstances for the startups companies and encourages the creativity and innovations of this startups from idea to the market.

On the other hand a quality management system (QMS: ISO 9001-2015) is a formal process used to review the operations, products and services of a business - with the objective being to identify areas that may require quality improvement. Quality management systems are required in all areas of business activity, regardless of the size of the institution. A good quality management system will:

- Reduce wastage
- Improve process control
- Increase market share
- Lower costs
- Facilitate training
- Meet customers' expectations
- Raise Morale

## **1.2 Statement of problem:**

Recently the term business incubators appeared which refers to organizations that offer startups space, collaborative work environment, networking, opportunities, funding, and support and shared equipment.

The business incubators need a structure for doing things property and efficiently which is provided by Quality management system.

Quality management system (QMS) is a formal system that documents processes, procedures, and responsibilities for achieving quality policies and objectives.

ISO 9001:2015 is by far the most recognized and implemented quality management system standard in the world. ISO 9001:2015 specifies the requirements for a QMS that organizations can use to develop their own programs.

At the practical level there is lack of implementation of the QMS (ISO 9001-2015) at the Sudanese companies in general and specially at the business incubators in Sudan. And this study has focused on the possibility of applying quality management system (ISO 9001-2015) in business incubators.

#### **1.4 Objective of the study:**

- Measuring the applicability of the quality management system in ACT business incubators
- Spreads Awareness through incubators culture of the importance of the QMS (ISO 9001-2015) to ensure the business incubators work better.
- Evaluate the satisfaction of business incubators customers according to the standards of ISO 9001-2015 clause: 9.1.2 customer satisfaction

#### **1.4 Hypothesis of the study:**

The Africa city of technology has the possibility and readiness to apply the quality management system to a good degree

**H1:** With regard to the context of the Organization, Africa City of Technology is fully prepared for implementation

**H2:** For leadership, Africa City of Technology is ready for implementation

**H3:** The Africa city of technology in term of support is well prepared.

**H4:** In term of planning management system, Africa City of Technology is well prepared.

**H5:** In term of performance evaluation and development, the Africa city of technology has the ability to progress well

## **1.5 Thesis layout**

1. Chapter one: consist of introduction, Study objective, Statement of problem, and Hypotheses of the Study.

2. Chapter two: consist of literature review of this study which include,

QMS (ISO 9001-2015) Introduction, Why to implement, How to implement, what is ACT and What is the concept of incubators.

Chapter three: research materials and methodology.

Chapter four: results of the study and analysis.

Discussions of the thesis results, conclusions, recommendations and suggestion.



## **Chapter Two**

### **Literature review and previous study**

## **2.1 Introduction:**

A Technology Business Incubator (TBI) is a form of business incubator that focuses on promoting technology-based business start-ups. „Technology based in this context means the whole range of technological activities, and is not just referring to high-technologies. „Business start-ups includes only legally organized companies or businesses being set up as legal entities. The TBI supports businesses wanting to sell their technology-based products or services to the marketplace, not the development of technologies as such. Therefore a TBI is not to be confused with an applied research Centre. Looking to Southeast Asian countries the majority of TBIs at this time focus on Information and Communication Technologies (ICT). However, these countries have also developed Technology Business incubators supporting entrepreneur in the textile and leather industries, fisheries, and agricultural and food sectors.

Business incubators are seen as efficient tools for technology transfer and cooperation between the scientific sector and the industry. Generally, they are targeted towards addressing local economic development issues through improvement of the entrepreneurial base.

At the local and regional level business incubators are at the core of tools for fostering start-up activities, job growth, technology transfer and innovation.

Although there are common characteristics that business incubators should include, and there are a few generic business incubator models, there is no single best practice model of a business incubator. Because business incubators should be embedded in the regional innovation system, they should therefore respond to the specific needs and

requirements of potential entrepreneurs in their region and should pro-actively address untapped regional potential.

Today there are more than 5,000 Business Incubators worldwide and their growth rate in developing and emerging market countries is outstanding. They are a favorite part of a set of tools which is used for local and regional development, and as such public subsidies or grants continue to remain a part of a BIs source of funding.

When properly planned and managed, and when they involve high-quality services as well as facilities and infrastructures, business incubators have a strong potential for a good return on investment. But it has to be emphasized that patience is needed by the promoters and sponsors. The community should not be expecting immediate success or financial independence from business incubators. (Dietrich, 2010)

A business incubator's main goal is to produce successful firms that will leave the program financially viable and freestanding, usually in two to three years. These incubator graduates have the potential to create jobs, revitalize neighborhoods, commercialize new technologies, and strengthen local and national economies. Typically, 30 percent of incubator clients graduate each year. (OKcommerce, 2017)

The main goal of a business incubator is to encourage the development of new business within the local community. By assisting a local entrepreneur to start a company in the area, the community is likely to benefit from an increase in the number of available jobs in the area and the additional revenue that is brought to the city or town as a result of the new business activities. (Lesáková, 2012)

Business incubator has evolved in the last thirty years, developing from early experiences with industrial estates and small enterprise service centers. The first generation incubators in the 1980s were essentially offering affordable

space and shared facilities to selected entrepreneurial groups. In 1990s the need was recognized for supplementing space with consulting, skills enhancement and networking, in order to access professional and support and seed capital for clients within the facility and external affiliates.

The special needs of technology. Based ventures led to the second generation “Innovation Center”. Starting in 1998, a new incubation model emerged in parallel to the first, which was intended to mobilize ICT and to provide a convergence of support towards rapidly creating growth- potential, technology based ventures. However, these dotcom decline sharply, together with the global economy. What has now developed is the third generation “International Enterprise Center” which looks outward towards the opportunities of the globalization (lalkaka, 2006)

## **2.2 QMS (ISO 9001:2015) Introduction:**

Quality refers to those features of a product which meet customer needs (Juran, 1988).

A quality system ISO9001 is defined as: a set of interdependent processes that function harmoniously in an organization, using various resources, to achieve objectives related to quality that was introduced by the International Organization for Standardization (ISO) (Heuvel, 2005)

In order to assist organizations to have a full understanding of the new ISO 9001:2015, it may be useful to have an insight on the revision process, how this revision reflects the inputs received from users of the standard, And the consideration given to benefits and impacts during its development.

Successful implementation of QMS is to take it as a strategic decision for the organization. The purpose of quality management system can be namely such as reducing possible errors all phases of projects by proper

control, finding faults/errors soon, measuring to avoid repeated mistakes, and determining and initiating corrective action/preventive measures (Aized, 2012)

Prior to the commencement of a revision (or amendment) to a management system standard, a “Justification Study” is prepared to present a case for the proposed project which outlines details of the data and inputs used to support its arguments. In relation to the development of ISO 9001:2015 user needs were identified from the following:

ISO Annex SL provides a common structure, text, terms and definitions for management system standards.

the results of a formal “Systematic Review” on ISO 9001:2008 that was performed by the members of ISO/TC 176/SC2

Feedback from the ISO/TC 176/SC2 Working Group on Interpretations an extensive worldwide “User Feedback Survey” on ISO 9001 was performed by ISO/TC

176/SC 2

The Justification Study identified the need for a revision to:

- adapt to a changing world
- enhance an organization's ability to satisfy its customers
- provide a consistent foundation for the future
- reflect the increasingly complex environments in which organizations operate
- ensure the new standard reflects the needs of all relevant interested parties
- align with other management systems (Standardization, 2015)

This is what ISO 9001 is all about. It is a set of criteria that, when satisfied by an organization, enable it to demonstrate its capability and in so doing

give their customer confidence that they will meet their needs and expectations.

Customer use it to obtain an assurance of product and service quality that they can't get simply by examination them.

It can be applied to all organization regardless of type, size, and product or service provided.

When applied correctly these standards will help organizations develop the capability to create and retain satisfied customers in a manner that satisfies all the other stockholders. They are not product or service standard- there are no requirements for specific products or services- they contain criteria that apply to the management of an organization in satisfying customer needs and expectations in a way that satisfies the needs and expectations of stakeholders. (Hoyle, 2017)

### **2.2.1 Plan-Do-Check-Act cycle**

Quality Management System (QMS) planned and established by documenting procedures for the process of organization to fulfill the need and expectation of internal and end customer.

ISO 9001 QMS process are organized representing the four steps of Plan-Do- Check- Act (PDCA) cycle. (Natarajan, 2017)

The PDCA cycle or Plan-Do-Check-Act cycle is known also as Deming wheel or cycle. It is systemic series of steps for continual improvement of process or a product. The cycle begins with plan step. In plan step the company needs to identify a goal or purpose. In do step, the company needs to implement components from plan cycle, for example making a product. Next step is study, where the outcome is monitored to see if it is working as planned. The next step act closes the circle. In this step comes the learning

which is used to adjust the goal or the methods of a process. ISO 9001:2015 standard is grouped around this idea

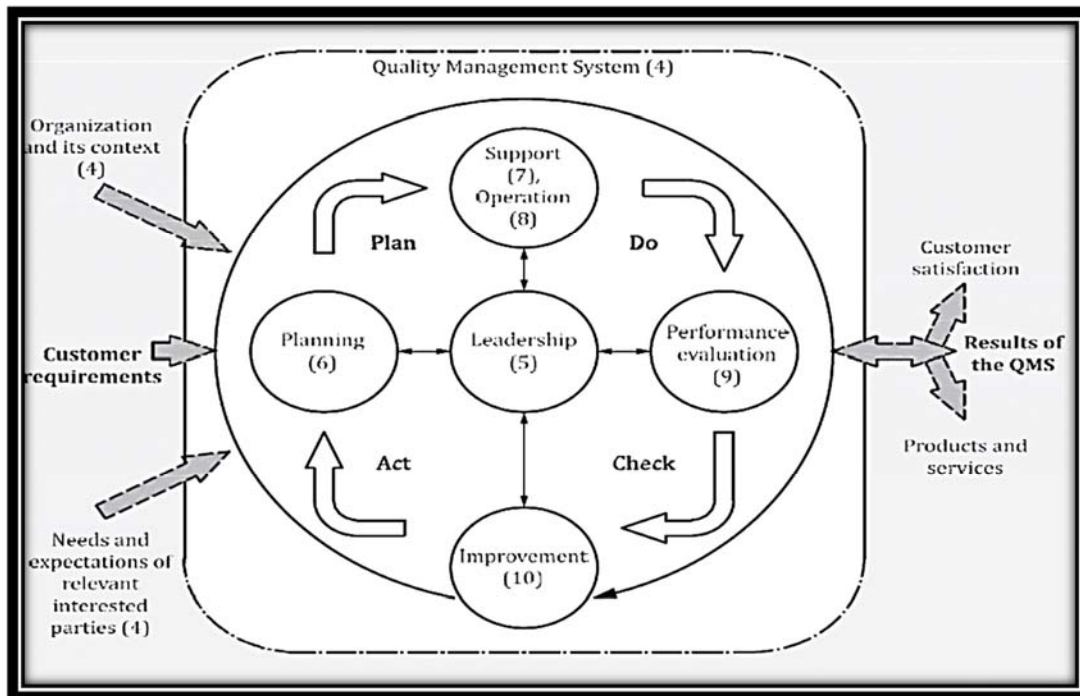


FIGURE 2.1. The PDCA of ISO 9001:2015 (ISO 2015)

ISO-9001 adopts PDCA (Plan –Do –Check –Action) methodology and based on the eight quality management principles which are customer focus, leadership, personnel involvement, process approach, system approach to management, continuous improvement, factual approach to decision making, and mutually beneficial relationships with suppliers (Lam, 2002)

## 2.2.2 ISO 9001:2015 risk-based thinking

The new revision is planned around risk based thinking. There has been risk-based thinking in earlier editions of ISO 9001 in their clauses. This edition the company needs to understand the context and determine risks as basis for planning. Standard also wants to address the risks that could influence their ability to provide products or services to the customer. It also wants to

identify opportunities that could enhance their ability to provide compliant products and services to satisfy customers. (Standardization, 2015)

A properly implemented and effective Business management system identifies and manages organizational risks to ensure that:

- The organization consistently delivers the products and services that customers want, when they want them and to the quality they expect.
- Customer satisfaction and loyalty is improved.
- Organizational goals and objectives are achieved.
- Organizational risk is identified and effectively managed.
- Product and services; and processes that deliver to customer are continually improved through innovation.
- Waste throughout the organization is identified and eliminated, and
- Partnership and the supply chain deliver value to the parties involved.

(Tricker, 2017)

### **2.2.3 The requirements of ISO 9001:2015**

#### **Clause 4: Context of the organization**

Clause 4.1: Understanding the organization and its context

The company shall determine external and internal issues that can affect positively or negatively.

Issues should be relevant to the QMS's purpose, its strategic direction and issues that can affect its ability to achieve the result(s) of it. The external and internal issues are the following:

- a) External issues are legal, technological, competitive, market, cultural, social and economic environments.



b) Internal issues are related to values, culture, knowledge and performance of the organization.

So the external issues can be for example legislation changes or the changes of the technology. Internal issues can be for example the competence of the staff or standards adopted by the company. These can be analyzed by using PESTLE (Figure) and SWOT (Figure) tools. After filling PESTEL analysis tool, the results from it can be used in SWOT analysis tool, where the strengths and weaknesses are internal issues and the opportunities and threats external issues.

**Table 2.1 Example of how to fill PESTLE**

<b>Factor</b>	<b>Likely to factors such as</b>
Political	World, European and Government directives, national and local organizations, institutional.
Economic	Funding mechanisms/streams, business/enterprise directives, internal funding models, budgetary restrictions, income generation target.
Social	General lifestyle changes, changes in populations, distributions and demographics and the impact of different mixes of cultures.
Technological	Major current and emerging technologies of relevance for your business
Legal	Worldwide and national proposed and passed legislation, requirements for working conditions, professional practice, contracting etc....
Environment	Local, national and international environmental impacts, outcomes of political and social factors.

**Table 2.2 Example of how to fill SWOT**

Strengths (Areas you do well or advantages of your organization )	Opportunities (External factors that may contribute to your organization and can build up your strength.)
Weaknesses (areas to be improved)	Threats Potential problems Risk caused by external factors that your organization may face.

(Standardization, 2015)

Clause 4.1 contains requirement for an organization to determine external and issues that can impact on and are relevant to the purpose and strategic direction of the organization.

The organization shall also monitor and review information related to relevant external and internal issue. (A.cianfrani, 2015)

- Clause 4.2: Understanding the needs and expectations of interested parties

The company should understand the needs and expectations of the interested parties that are relevant to the QMS. These parties can be shareholders, owners, customers, employees etc. The company shall monitor and review this information.

For example, if the interested parties are the employees. Their needs and expectations can range from Professional development to salary. Other could be customer's, who are looking for quality, price and performance. Tools that can be used for employees are following information about sick leave, survey about workplace. For customer these could be customer satisfaction, work exhibition.

(Standardization, 2015)

Clause 4.2 introduces the concept of an organization determining what interested parties are relevant to the organization and therefore to its QMS.

It further indicates the requirement that the organization determine, monitor and review information about relevant interested parties. (A. Cianfrani, 2015)

- Clause 4.3: Determining the scope of the quality management system

The company shall determine the boundaries and applicability of the QMS to establish its scope. When determining the scope, the company shall consider the two earlier sub-clauses and the products and services that the company offers.

The company shall apply all the requirements of this standard if it is possible. If a requirement cannot be applied, then the company needs to provide justification to exclude said requirement.

The scope of the QMS shall be documented and maintained.

When determining the scope of the QMS, the company needs to figure out what services and productions can be in the QMS. The products and services that can be taken to QMS will need to fulfill the requirements of the standard. If there is a product or service in QMS, but cannot fulfill a clause in the standard, then the company needs to explain, why they cannot fulfill the clause. Also within scope it should be stated which factories are within it. (Standardization, 2015)

Clause 4.3 digresses a little to define a requirement that the organization address the boundaries and applicability of its QMS so it can provide a full description of the QMS scope. This clause also indicates areas that the organization shall consider when it determines its Scope, such as the external and internal issues that are determined (as Required in clause 4.1) and the

Requirement of the relevant interested parties that were identified in clause 4.2. (A.cianfrani, 2015)

#### **Clause 4.4: Quality management system and its processes**

The company shall establish, implement, maintain and continually improve the QMS, in accordance with the requirements of this standard.

The organization shall determine the processes needed for QMS. These are:

- a) Inputs required and outputs expected
- b) The order and interactions of the processes
- c) Criteria and methods needed to ensure effective operations and control
- d) The resources needed for the processes
- e) Assigning responsibilities and authorities
- f) Address risks and opportunities as determined in clause 6.1
- g) Ensure that processes achieve their intended results
- h) Improve the processes and QMS

What the company needs to state is what materials we need, processes and equipment to modify to the end product. People responsible for the product are done as criteria and methods state. This information can be shown either in written on a document or it can be shown in an in a process tree.

The company shall maintain and retain documented information to support the operation of its processes and have confidence that processes are carried as stated. (Standardization, 2015)

Clause 4.4 contains requirements for the organization to establish, implement, maintain and continually improve a QMS, including the process needed and their interactions. (A.cianfrani, 2015)

### **2.3.2. Clause 5: Leadership**

#### Clause 5.1: Leadership and commitment

Top management shall demonstrate leadership and commitment where they have to ensure that quality objectives are established and ensure the effectiveness of the QMS and that it achieve its intended results.

Top management shall demonstrate the commitment with respect to customer focus by that the requirements are determined, understood and met. Also addresses the risks and opportunities that can affect the products and services.

Before the company makes a deal with their customer, they need to know requirements of the customer and to communicate with e-mail, calling them with a phone or talking face to face.

- Clause 5.2: Policy

Top management shall establish, implement and maintain a quality policy, which is in line with ISO quality principles and companies own policies. The company will commit to satisfy applicable requirements and commits to continual improvement of the QMS.

The quality policy shall be available and be maintained as document and to be available for interested parties for example in the website of the company. It needs to be understood and applied within the company.

When creating policy for the company, firstly the policy should create the framework for setting and reviewing objectives and it should be appropriate

for the company. Secondly the company needs to define quality improvement and how they handle customer needs.

- Clause 5.3: Organizational roles, responsibilities and authorities

Top management shall assign responsibilities and authorities for relevant roles, communicate it and ensure that it is understood within the company. Responsible needs to ensure that the processes perform as intended and that the QMS meet the requirements of the standard. The responsible people need to report the performance of the QMS and the opportunities to improve it. A Quality manager can be responsible of the development, the implementation and management of the QMS. Making an organizational chart and publishing in intranet of the community helps to understand see the roles responsibilities of people. (Standardization, 2015)

Leadership determine unity of purpose, direction and internal environment of the organization.

They must try to create and maintain the internal environment in which people can become fully involved in achieving the overall organizational objectives.

Leadership has to build quality mind-set and develop quality culture within the organization. (Lakhe, 2016)

### **2.3.3. Clause 6: Planning**

- Clause 6.1: Actions to address risks and opportunities

The company should establish risks and opportunities and how to manage them in their QMS. Risks and opportunities should be seen as the potential impact, whether good or bad, in their planning, design, development or

release of services or products. When managing risks and opportunities, it is needed to evaluate the effectiveness of the actions taken for them.

- Clause 6.2: Quality objectives and planning to achieve them

The company shall establish quality objectives for functions, levels and processes needed for QMS.

Objectives need to be monitored, communicated and update it, if needed to be. The company will document the quality objectives.

When making quality objectives, they need to align with the company's policy. Company needs to come up with an objective, like less time to deliver a packet and plan the resources needed to improve it and how to do it. For example, the delivery company UPS. UPS is a delivery company, which delivers packages to the customer. Their objectives are to save gasoline and to deliver packages faster.

- Clause 6.3: Planning of changes

If the company decides to makes changes to QMS, the company needs to consider the purpose of the changes and the consequences of the change to the system. (Standardization, 2015)

Planning is the first step of (Plan -DO- Check- Act), and is an important aspect of QMS.

Planning is Continuous activates in business and therefore the requirements of the quality management planning Process should be integrated with it so as to ensure that it is not visualized as separate process and contradiction are avoided, this also helps to improve the organization and its quality performance. (Hoyle, 2018)

#### **2.3.4. Clause 7: Support**

- Clause 7.1: Resources

The company needs to determine and provide the resources needed for QMS. The company needs to consider the capabilities of existing internal resources and what they need to obtain from supplier. Also they need to determine the knowledge necessary to the operation and to achieve conformity of products and services.

It is also needed to show that the company has enough and capable people to effectively operate and control processes of QMS. Company needs to determine the necessary infrastructure for processes of the QMS to be effective, for example buildings, equipment, utilities to achieve conformity of products and services. It also needed to determine a suitable work environment for the processes. For finding a suitable work environment human and physical factors are needed to be consider. These factors are social, psychological and physical.

When making the products, the company needs personnel that can make the products, place to make them and create an environment to work in.

The company needs to measure resources and to ensure valid and reliable results. When measurement traceability is required, or is essential for the company, then they should ensure that measuring equipment is calibrated at specific intervals and the equipment should be taken care of. If the equipment is found to be faulty, then the company should take appropriate actions. The company should document the information as evidence of fitness for purpose of the monitoring and measurement.



### Clause 7.2: Competence

The company shall determine the competence of the personnel doing their work that they need to have, that affects the QMS. The Company needs to make sure that the worker is competent doing their work by training, education or experience. This information needs to be documented as evidence of competence. With the program BMS, the company can track the competence of personnel.

### Clause 7.3: Awareness

The company shall ensure that the workers that are working in the company are aware of the quality policy, its objectives and their contribution to QMS and the importance of conformance. The communication can be done by managers.

### Clause 7.4: Communication

The company shall manage communications internally and externally. When communicating we need to what, when, with whom, how and who to communicate.

- Clause 7.5: Documented information

The company's QMS shall include the documented information required by the standard and necessary for the effectiveness of QMS by the company. When creating or updating the document the company needs to manage their files so that they are easily identified and read. These files need to be reviewed before putting them into system.

The file distribution should be controlled so that necessary people can access them also deny improper usage. (Standardization, 2015)

In order to achieve the desired result , the organization has to plan the resources keeping in view the capability of the organization ,constraints and availability of existing internal and external resources based on the requirements, the organization has to take the decisions related to the out sourcing of the activity.

The resource are categorized into three aspect:

People

Infrastructure

Environment. (Hoyle, 2018)

### **2.3.5 Clause 8: Operation**

- Clause 8.1: Operational planning and control

The company shall plan in line with clause 6 and use those operations of QMS that is needed to produce products and services. What is needed is determining the requirements, establishing criteria for the processes and the acceptance of products and service, what resources are needed to make the product or do the service, implementing control by using the criteria.

The information that is needed to documented and maintained are: confidence that the processes are carried out as planned and able to meet the requirements to ensure the conformity of products and services.

The company needs to plan the processes, what to do and what is needed with the criteria in the mind.

- Clause 8.2: Requirements for products and services

Company has to communicate with the customer about providing information about products and services, about contracts and orders,

obtaining customer feedback or handling customer property. Sales manager will communicate with the customer related about the product or service

When determining the requirements for products and services to be offered to customer, the company will need to define the requirements for the products and services and that they can meet. The company needs to review this information before committing to it. The company will retain documents about results of the review and any new requirements by the customer.

If there is existing product and the requirements of it is changed, then the documents are changed and the proper personnel are informed about it. This can be done by management

- Clause 8.3: Design and development of products and services

The company should establish and implement design and development processes, which are enough to make ensure provision of products and services and to maintain it. The following steps are required:

- a) The planning of design and development
- b) Design and development inputs are required to be determined
- c) How to control design and development processes
- d) How outputs will be produced
- e) Review all design and development changes

All the stages need to be documented.

- Clause 8.4: Control of externally provided processes, products and services The Company will make sure that supplier products, services or processes conform requirements.

Supplier should be evaluated and monitored, based on their ability to supply. Information needs to be documented.

Company should also ensure that suppliers supply problems won't hinder their own processes. They need to explain the extent of control. The company needs to have communicated the requirements of approval to its supplier.

The company needs ensure that the supplier is able to supply enough of materials or parts to sustain production within the company. The company can make a customer audit to the supplier to see if they can meet the requirements set by the company. If the chosen supplier passes, then they given information about the product and the criteria that the products must conform. The quality of the supplier should be monitored by using different tool, for example: quality of product and on-time delivery.

- Clause 8.5: Production and service provision

The company needs to produce products and services in a under controlled conditions. The controlled conditions are what to produce or the service to be provided and known results of them. Way to monitor and measure activities that the criteria set by the customer and the company has been met.

Suitable infrastructure and work environment for the operations and suitable personnel to work there.

If there are several stages then the company should be able to identify and trace these stages of production. Tracing can be done by customer order and with ERP.

If the company has customers or suppliers own property, it needs to be identified and taken care of. If the property is not suitable or is damaged,

then the company needs to inform the owner of the property and document the information.

The products need to be preserved until it is delivered to the customer. This can include handling, storage, packaging and delivery.

The company needs to meet the requirements of post-delivery activities. These can range from country's laws to customer requirements and feedback.

Company has to review and control changes for production or service provision. When changing, the company needs to ensure that it continues to conform to requirements. Documented information is needed of review of changes, authorized personnel and actions arising from the review.

- Clause 8.6: Release of products and services

The company will release products or services once finished. Product or service cannot be released to the customer if it's not ready, unless customer states otherwise. Documents needed are that the requirements of product or service have been fulfilled and there should be possibility to trace the person(s) who released it.

- Clause 8.7: Control of nonconforming outputs

When there is a nonconforming outputs that doesn't fulfill the requirements, these outputs are taken aside to identify the mistake. There are one or multiple ways that a company can do when there is a nonconforming output. These can be fixing or depending on the nonconforming issue, then communicating with customer and see if they take it with the issue.

Nonconforming outputs need to be documented. These documents shall retain, describing of the nonconformity, what is done, describe the

expectations and identifying the authority deciding the action. (Standardization, 2015)

In ISO 9001:2015 operation clause addresses to actual planning, execution and control of core process of organization. . (Hoyle, 2018)

### **2.3.6 Clause 9: Performance evaluation**

- Clause 9.1: Monitoring, measurement, analysis and evaluation

The company shall determine what will be monitored and measured. This is needed to evaluate the performance and the effectiveness of QMS. The company chooses what to measure, how and when.

IMS offers the tools to gather measurements for example about the processes.

The company shall monitor customers satisfaction, which their needs and expectations have been fulfilled. The company will determine the ways obtaining the information of the customer satisfaction.

Customer satisfaction can be measured with a survey. (Standardization, 2015)

Measurement beings with a definition of the measure with some known quantities of the same kind, if the measure is not accessible for direct comparison, it's convertal or transduced into analogous measurement signal.

Analysis is a thinking process. It is Objective.

Analyzing the results of monitoring and measurement will enable us to understand what they mean and whether they are in line with what understanding of what the data are telling us.

Evaluation is judgmental and reaches a conclusion after assessing the result of analysis evaluation of the results of analysis will therefore tell us the significance relative to the object of the original measurement and will draw conclusion as to whether the results are good or bad, valid or invalid whether what we are doing is efficient and effective and therefore acceptable or not. . (Hoyle, 2018).

- Clause 9.2: Internal audit

The company will conduct internal audits at planned intervals to provide information on QMS and that it follows the company's own requirements for its QMS and the requirements of the standard.

The company shall make its own audit program(s) including the frequency, methods and reporting, which shall take report problems in processes, changes affecting the company and previous results from last audit. Documents from implementation of audit program and the audit results should be retained.

Auditors should be impartial during auditing. The results should be reported to relevant management.

If there are problems then the company should do corrective actions.

- Clause 9.3: Management review

The management shall review the company's QMS, at planned intervals to ensure its continuing suitability, adequacy, effectiveness and alignment with the strategic direction of the company. In management review input, the company should consider actions of the last meeting, changes in external and internal issues, performance of QMS its effectiveness, resources and the risks and opportunities.

The outputs of the review shall include decisions and actions related to opportunities for improvement, changes needed for the QMS and the resource needs. The company will keep the documents as evidence of the results.

The company can have a weekly or monthly meeting, where the management will meet and discuss about QMS. In management review, the company can review for example, the results of customer feedback. Let's say, if the customer has returned the product that the company made. In the review, the company will review the problem and the opportunities to improve. After review the decision is made to what will be done. (Standardization, 2015)

### **2.3.7 Clause 10: Improvement**

Organization has to demonstrate that the system is suitable, adequately implemented, maintained and evaluate to meet the planned in tended outcomes as per the quality, policy, objectives, and specified requirements.

The rate extent and timescale of actions that support continual improvement are also to be determined by the organization the intended outcome of planned actions and other system changes leads to effectiveness the performance of the organization. (Hoyle, 2018).

The company shall improve products and services to meet requirements of customer and enhance the customer satisfaction.

- Clause 10.2: Nonconformity and corrective action

When nonconformity occurs, including any complaints, the company will react to it by controlling or correcting it, or by deal with the consequences.



The company needs to eliminate the cause(s) of nonconformity so that it doesn't recur or occur elsewhere. With root cause analysis, the company can find the reason nonconformity and to correct it.

- Clause 10.2: Continual improvement

The company will review all the information collected from planning, support, operation and performance analysis stages and make improvements to the QMS. (Standardization, 2015)

### **2.3. Why to implement?**

The adoption of a QMS is a strategic decision that helps an organization to improve its overall performance and to provide a sound basis for its sustainable development initiatives.

Many organizations implement a formal quality management system after finding that their customers (in both the private and public sectors) want assurance that the products and services they are looking to purchase or obtain will meet their requirements for quality. Those customers are looking for the confidence that can be provided by an organization offering products and services produced under an effective quality management system, such as one conforming to ISO 9001.

A quality management system, on its own, will not necessarily lead to an improvement of work processes or to improvements of your products and services. It will not solve all your problems. It is a means for you to take a more systematic approach to fulfilling your organization's objectives, which in turn should achieve such improvements. (Standardization, 2016)

The purpose of ISO 9001 is to achieve customer satisfaction meeting customer requirements. While meeting requirements and preventing nonconformity have been fundamental to ISO since its initial issue in 1987,

ISO 9001:2015 continuous the enhanced emphasis on customers. There are key activities and organization needs to understand and implement that are related to customer focus and customer satisfaction in several clauses in standard. (Cianfrani, 2017)

## **2.4. How to implement?**

When implementing ISO9001-2015, first the company needs to know the context of the organization.

This means that the company needs to understand the external and internal issues that are relevant to the company's purpose. External issues can be legal, technological, market etc. and internal can be values, culture, knowledge etc.

After that the company needs to determine the scope of QMS.

Managers of the company need to provide leadership for the QMS, by supporting it, by expecting people to focus on quality and on customers.

Managers need to provide compliant products and services, manage risks and opportunities. Managers need to establish, implement and maintain a quality policy. This policy needs to appropriate to the purpose and context of the organization and supports its strategy.

The company needs to assign roles, responsibilities and authorities. These people need to ensure that

QMS fulfills the requirements of the standard and processes deliver their intended outputs and report on the performance of QMS and the opportunities to improve it. When the company is developing the

QMS, they need to address the risks and opportunities that could influence QMS or disrupt its operations.

The company has to establish quality objectives and a plan to achieve these. The quality objectives have to be consistent with the quality policy and to be measurable. To achieve them, the company needs to determine what will be done, the resources that are required, person who will be responsible, a deadline and how to evaluate the results. When planning to do changes to the QMS, the company has to carry it out in a planned manner.

Company has to support its QMS by managing communications and provide the necessary requirements. The company has to provide competent people with the proper infrastructure and work environment. These need to be having a proper way to be monitored and be measurable. This information is to support the process operations and to provide information for the improvement clause.

The company needs to determine the scope of the need documented information. There are two kinds of documents needed for this QMS: documents to maintain or establish QMS and documents needed to retained, for providing evidence of results achieved. The clauses that need documented information are the following:

Documented information needed to be maintained:

- 4.3 The scope of the QMS
- 4.4 QMS and its processes
- 5.2 Policy
- 6.2 Quality objectives and planning to achieve them
- 7.5 Document information

Documented information needed to be retained:

- 4.4 Quality management system and its processes
- 7.1.5 Monitoring and measuring resources

- 7.2 Evidence of competence
- 8.2.3 Review of the requirements for products and services
- 8.3.2 Design and development planning
- 8.3.3 Design and development inputs
- 8.3.4 Design and development controls
- 8.3.5 Design and development outputs
- 8.3.6 Design and development changes
- 8.4 Control of externally provided products and services
- 8.5.2 identification and traceability
- 8.5.3 Property belonging to customers or external providers
- 8.5.6 Control of changes
- 8.6 Release of products and services
- 8.7 Control of nonconforming processes
- 9.1 Control of monitoring, measurement, analysis and evaluation
- 9.2 Evidence of audit programs and the audit results
- 9.3 Management reviews
- 10.2.2 a) The nature of the nonconformities and any subsequent actions taken
- 10.2.2 b) the results of any corrective action

When creating documents they need to be easy to identify, should be in appropriate format and should be reviewed and approved for usage. These documents need to be available for where and when they are needed and should be protected from improper use.

The company needs to develop, implement and control the operational processes that the company needs in order to provide products and services and to manage and control risks and opportunities. The company needs to clarify how products and service requirements will be managed.

Communication with the customer is needed to be defined, for example providing information relating to products and services or obtaining feedback from customer. Requirements of the customer are needed to be confirmed before acceptance.

Design and development process is needed to be established where the production or service is planned, inputs are defined, control it to ensure results are achieved and the outputs fulfill the requirements of the inputs.

Performance of the QMS is needed to be evaluated by using the documented information. If there are problems in the QMS, the company will have to improve or fix the problem. Internal audits are needed to evaluate that the QMS conforms the company's own requirements and the requirements of the standard. (Röyttä, 2016)

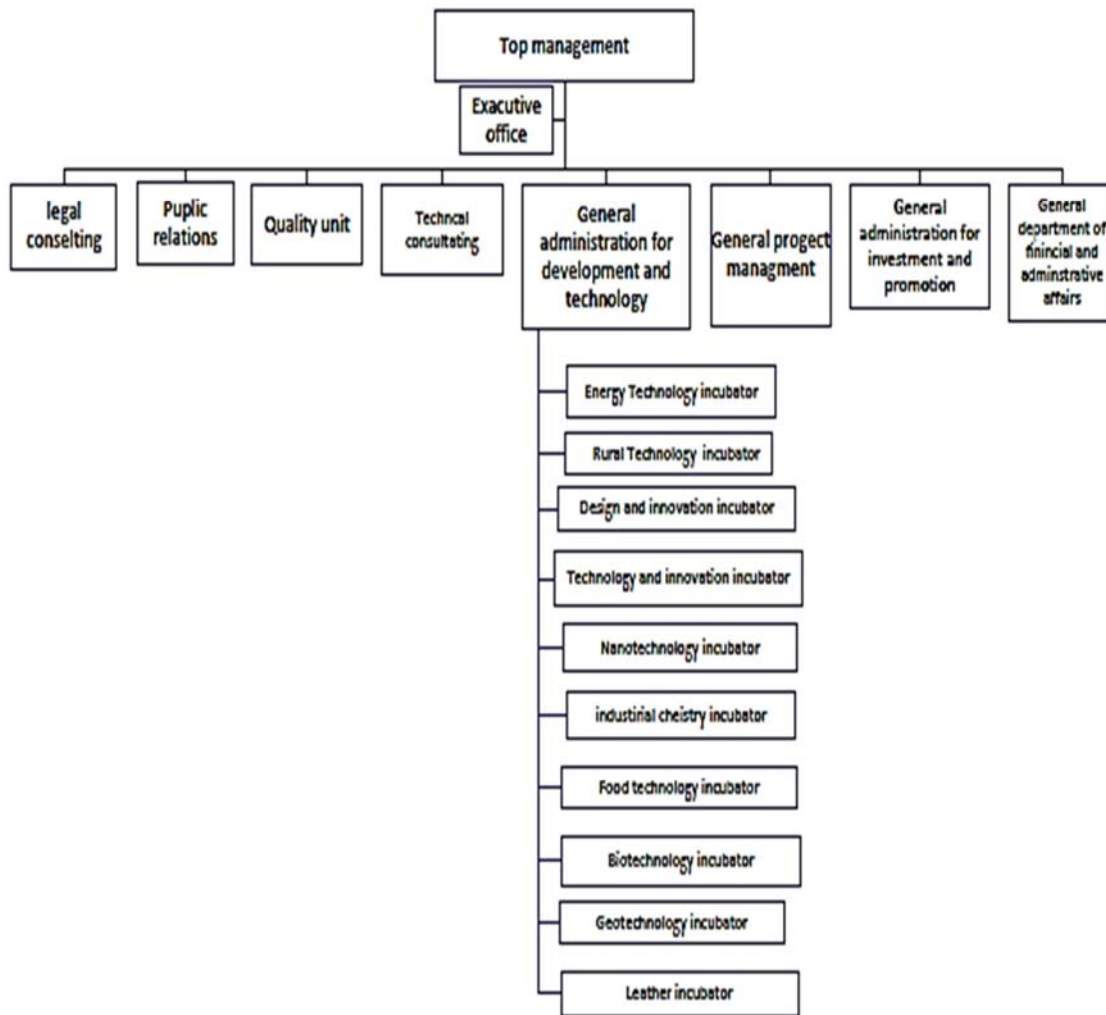
## **2.5 What is ACT?**

ACT: Africa city of Technology Was established in 2009, it is an institution that aims to bridge the results of scientific research and technology to society in the form of concrete products, and linking technology to development and production and to encourage investment in the fields of technology through the dissemination of knowledge and culture of technology and provide the appropriate infrastructure for research and technology manufacturing, as well as the provision of infrastructure and related services.

The objective of establishing Africa city of technology:

- Contribute to the implementation of industrial and urban development programs and encourage work in the field of industrial and urban investment in coordination with the competent authorities.
- Contribute to the establishment of training and rehabilitation institutions.

- Encouraging scientific research and harnessing the capabilities of



science and technological knowledge for development purposes.

- Contribute to the field of social development and provide services that contribute to the development and of society and the relevant elements and the development of talents and capabilities.

**Figure 2.2 ACT structure**

Source: Service file and structure of ACT

## **2.6 What is the concept of business incubators?**

Incubators are an advanced method in how to benefit from the pooling of youth capacities and employ them for projects of economic feasibility and good return. The incubator can be defined as an integrated set of common services, moral facilities, support mechanisms and consultations available for a specific period of time by an existing institution with its recognized legal entity and recognized legal personality.

Incubators are a new and innovative idea in creating a new culture of work away from the culture of full employment and the culture of paternity of the state for all and employment of all where there is no country in the world that can employ all its children. The idea of incubator is to embrace the work of pioneers and innovators to provide them with the care, training and equipment and all that is necessary for them to develop their ideas and actions and then move outside the incubator to embrace the incubator others in the process of continuous renewal

Incubators have proven effective over the past years in the United States and Europe, and 87% of incubators are still in place. Incubators are institutions that have all the necessary capabilities for setting up projects and establishing companies. It is a network that connects businessmen, producers and researchers. This system is managed by a specialized department consisting of academics and researchers. These incubators are held within universities and research centers to benefit from workshops, laboratories and researchers.

Why incubators originate:

1. High rates of failure of small enterprises at the beginning.
2. To overcome the obstacles facing these projects



3. Providing financial, technical, administrative and marketing resources for projects
4. Employment of graduates

**ACT includes 10 business incubators which are:**

1. Energy Technology Incubator
2. Rural Technology Incubator
3. Design and Innovation Incubator
4. Technology and Innovation Incubator
5. Nanotechnology Incubator
6. Industrial Chemistry Incubator
7. Food Technology Incubator
8. Biotechnology Incubator
9. Terotechnology Incubator
10. Leather incubator

The number of employees within these incubators is **200** people.

**2.7 Previous study:**

Entitle: **Implementing the Quality Startup Management System Model in Hong Kong: A case study**

By: Kim-Hung Lotto LAI

This paper aims to introduce a systematic approach model named “Quality Startup Management System (QMS) Model” through literature review and analysis, focus group and case study. QMS integrated Business Side of startup using Business Model Generation/Canvas (BMG/C) and Management Side

under ISO 9001:2015 Quality Management System, as well as, to simplify the model to fit startups requirements and overcome their limitations. (Lotto, 2017)

Entitle: **Quality Management System for Micro and Small Enterprises**

By: Rosley Anholon, Eugênio José Zoqui, Osvaldo Luiz Gonçalves Quelhas, Olívio Novaski

The purpose of this paper is to provide a structured method to implant a quality management system, following the requirements of the ISO 9001 in micro and small enterprises. This method also uses concepts from the Balanced Scorecard, the 5S Program, the QC Story and the São Paulo Management Quality Award. (Rosley Anholon1, 2017)

Entitle:

**The Evolution of Quality Management Systems To Assist Manufacturing Entrepreneurs In Incubation Clusters.**

By: Dudley Jura, Gert Adriaan Oosthuizen and Janharm Pretorius.

In this study several manufacturing incubators in South Africa were visited to conduct an incubator quality management systems capability analysis. The stage of cluster growths of these incubators were plotted onto the quality management framework. Current best practices are highlighted and future work discussed. (DUDLEY JURA, 2015)

# **Chapter Three**

## **Methodology**

### **3.1 Introduction**

The purpose of this chapter is to explain the methodology used in gathering the information required for the purpose of this research. It highlights the source of data used, tools used in collection of data and data analysis.

### **3.2 The Methodology:**

In order to obtain data for the possibility of applying quality management system (ISO 9001-2015) in business incubators at Africa city of technology the researcher adopted an analytical, descriptive and statistical approach.

To get out the results as in accurate as possible the study sample was diversified in terms of coverage on the following:

- Gender :( Male and Female)
- Individuals of different age groups (20-30 years, 30-40- years, 40-50 years, 50-60 years).
- Individuals from different qualifications (Diploma, B.Sc., M.Sc., Ph.D.).
- Individuals from different professional Occupation (Quality, Researcher, Sales, Network, Marketing, It, Manager, Finance, Developer and others).
- Individuals in terms of years of experience (1-5 years, 5-10 years, 10-15 years, 15-20 years and over 20 years).

### **3.3 Design of the questionnaire form**

This design was chosen to achieve the objectives of the study, and then developed a questionnaire consisting of questions comparing the requirements of the standard and the current situation in the ACT.

Questionnaire form was designed according likert fifth scale.

(Strongly agree, agree, neutral, disagree, and strongly disagree)

### **3.4 The study population and sample:**

ACT has “200” employees, distributed in 10 incubators. For the purpose of this a study “132” employee were randomly chosen to represent the research sample and below equation was used:

$$n = \frac{z^2 * p * q}{d^2}$$

Where; z = (1.96) level of tendency,

p = percentage of coverage in ACT

q = (1-p) ACT coverage, and d = marginal error.

Number of distributed questionnaire form= 132

Number of received questionnaire form= 132

Number of questionnaire form analyzed= 132

This method allowed measuring the readiness of Africa city of technology to implement the quality management system.

### **3.5 Sample techniques:**

This study used SPSS program (Statistical Package for Social Science) to analyze the collected data.

### **3.6 Ethical Consideration**

The study protocols were ethically and scientifically passed by the scientific and ethics committees of Sudan University of Science and Technology.

**Chapter four**  
**Results and Analysis**

## **4.1 Data analysis**

The population study meaning all the members the researcher used to results circulates it. containing, a request from study individuals to determine their answers about what it describes all phrase according to the Likert scale which consists of five levels (strongly agree, agree, Neutral, disagree, strongly disagree).

## **4.2 Statistical methods used:**

To achieve the objectives of the study and to verify hypotheses, statistical methods were used the following:

- 1 - frequency distribution of the answers.
- 2 - percentages.
- 3 - median.
- 4 - Chi-square test for the significance of differences between the answers.

To get results as accurate as possible, has been used SPSS statistical software, which indicates a shortcut to Statistical Package for Social Sciences

## **4.3 Test hypotheses**

To answer the questions of the study and verification of hypotheses will be calculated median for each of the phrases in the questionnaire and which show views of individuals the study, which was given Grade (1) as a weight for each answer "Strongly agree", and grade (2) as a weight for each answer "Agree" grade (3) as a weight for each answer "Neutral", grade (4) as a weight for each answer, " Disagree" and grade (5) as a weight for each answer "Strongly disagree".

To know Trends answer, by calculated median. and then it will use the Chi-square test to know the significance of differences in answers.

Table (4.1) shown the distributions of the respondents according to the sex

Sex	Frequency	Percentages
Male	67	%50.8
Female	65	%49.2
	132	%100

Source: Compiled by the researcher from the actual data of the field study, 2019

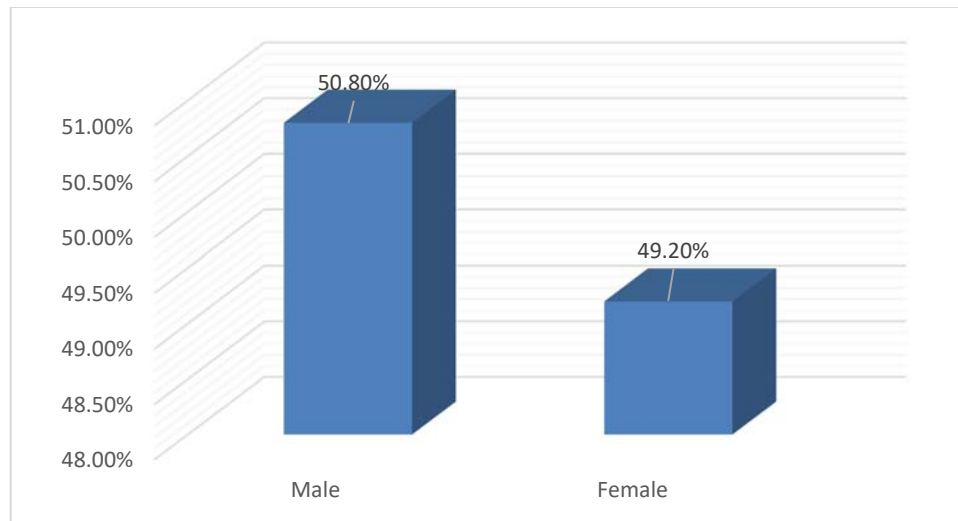


Fig (4.1) shown distribution according to Sex

According to table (1) and fig (1) they showed that about 50.8% of respondents are male and about 49.2% are female. Which indicate that the majority of individual are male 50.8%

Table (4.2) shown the distribution of the respondents according to the



age

age	Frequency	Percentages
20_30	61	%46.1
30_40	31	%23.5
40_50	24	%18.2
50_60	16	%12.1
Total	132	%100

Source: Compiled by the researcher from the actual data of the field study, 2019

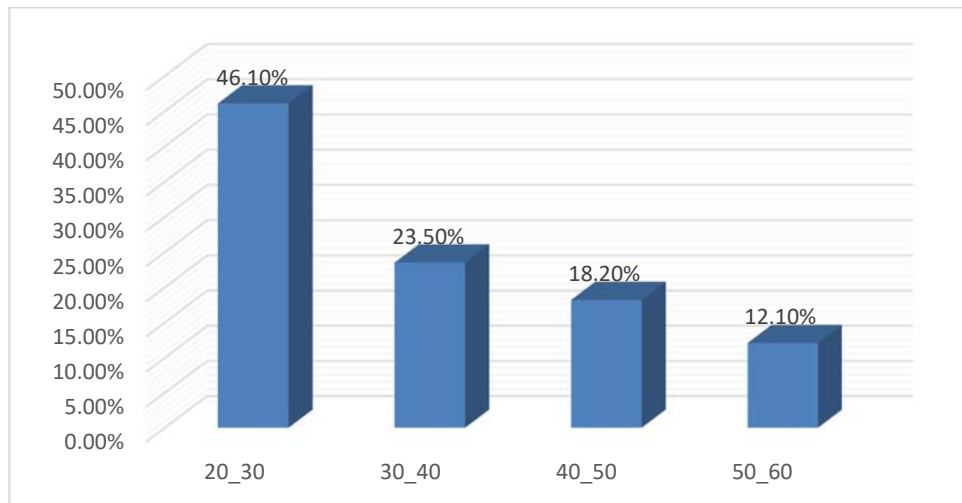


Fig. (4.2) Shown the distribution of the respondents according to the age

According to table (1) and fig (1) they showed that about 46.2% of respondents are age 20-30, 23.5% are age between, 30-40. And 18.2% are between 40-50, 12.1% are age 50-60 which indicate that the majority of individual are age 20-30) 6.1%).

Table (4.3) shown the distribution of the respondents according to the Qualification

Qualification	Frequency	Percentages
Diploma	7	%5.3
B.S.C	71	%53.8
MS.C	34	%25.8
PH.D	20	%15.2
Total	132	%100

Source: Compiled by the researcher from the actual data of the field study, 2019

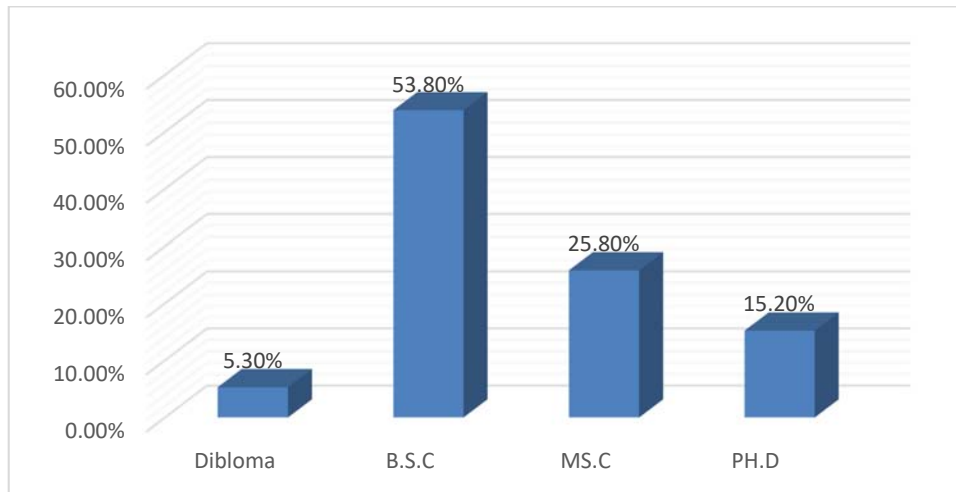


Fig (4.3) shown distribution according to Qualification

According to table (3) and fig (3) they showed that about 53.8% of respondents their qualification were B.Sc. and about 5.3% their qualification were Diploma. While 30.9% their qualification were PHD and master. Which indicate that the majority of individual their qualification were BCs53.8%

Table (4.4) shown the distribution of the respondents according to the Occupation

Occupation	Frequency	Percentages
Quality	15	11.4%
Researcher	24	18.2%

Sales	8	6.1%
Notwork	1	4.5%
Markiting	6	5.4%
It	1	0.8%
Maniger	1	0.8%
Finance	15	11.4%
Devoloper	3	2.3%
Other	58	43.9%
Total	132	%100

Source: Compiled by the researcher from the actual data of the field study, 2019

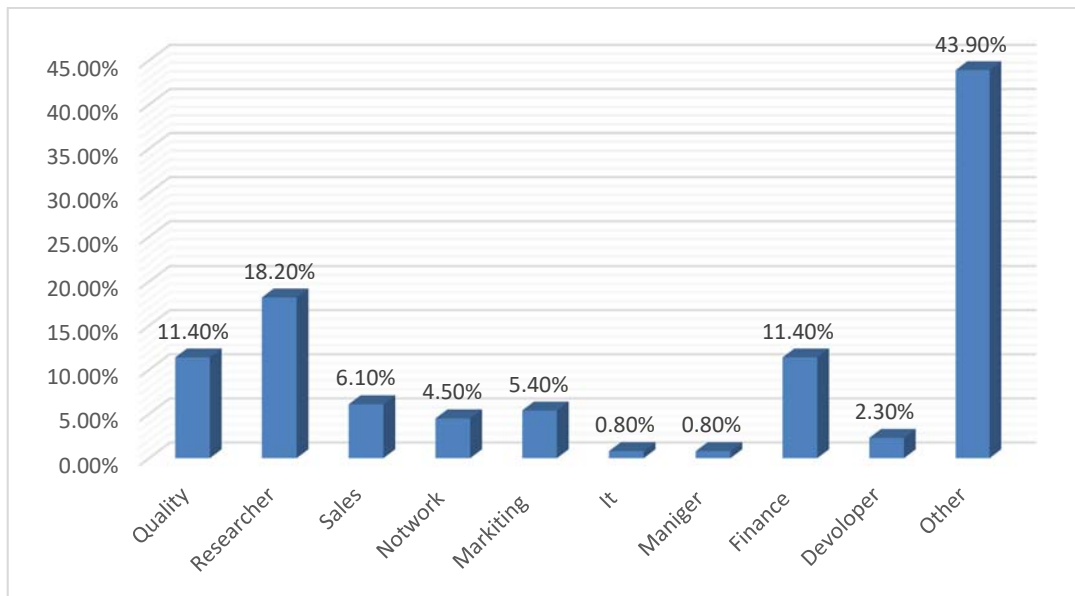


Fig (4.4) shown distribution according to the Occupation

From table (4) and fig (4) we showed that, the majority of individual study is from occupation (other) by (43.9%).

Table( 4.5)shown the distribution of the respondents according to their years of experience.

Experience	Frequency	Percentages
1_5	84	%63.6
5_10	11	%8.3
10_15	22	%16.7
15_20	3	%2.3
More than 20	12	%9.9
Total	132	%100

Source: Compiled by the researcher from the actual data of the field study, 2019

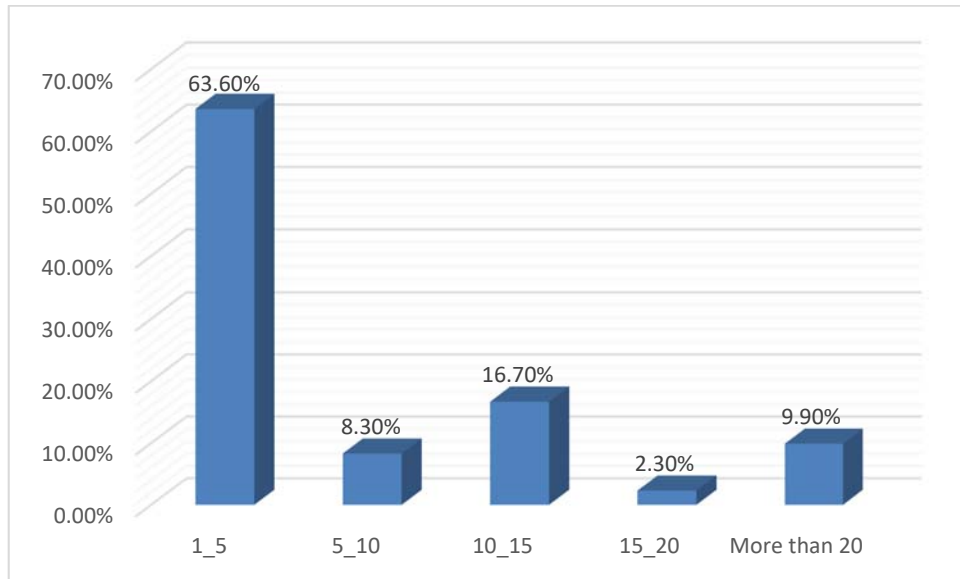


Fig (4.5) shown distribution according to experience

According to table (5) and fig (5) they showed that about 63.6% of respondents their years of experience were between 1-5 and about 8.3% their experience were 5-10 years .while 16.7% their experience were between 10-15 . Whereas 2.3% and 9.1% their years of experience were 15-20 and over 20 years that indicate that the majority of individual their experience between 1-5 years (63.6%).

#### **4.4 Reliability and consistency statistic**

##### **Reliability Statistics**

<b>The consistency Cronbach's Alpha</b>	<b>Reliability</b>
0.819	0.94

#### **4.5 Discussion the hypothesis:**

### First hypothesis

With regard to the context of the Organization, Africa City of Technology is fully prepared for implementation

Table( 4.6)shown the answer of the respondents to the first phrase of the study hypothesis

No.	Phrases	Frequency				
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Internal issues have been identified in ACT business incubators.	30	86	14	1	1
2	External issues have been identified in ACT business incubators.	35	67	21	9	0
3	Interested parties have been identified in ACT business incubators	34	79	18	0	0
4	The scope of QMS has been defined in ACT incubators.	42	71	16	3	0
5	A clear Process approach has been established for ACT business incubators	41	66	18	6	1

Source: prepared by researcher, using SPSS, 2019

Table (4.7)shown Chi-square test results:

No.	Phrases	Chi-square value	P-value	Median	Trend
1	Internal issues have been identified in ACT business incubators.	189.74	0.000	4	Agree

2	External issues have been identified in ACT business incubators.	45.81	0.000	4	Agree
3	Interested parties have been identified in ACT business incubators	56.9	0.000	4	Agree
4	The scope of QMS has been defined in ACT incubators.	82.24	0.000	4	Agree
5	A clear Process approach has been established for ACT business incubators	110.34	0.000	4	Agree
Hypothesis		399.64	0.000	4	Agree

Source: prepared by researcher, using SPSS, 2019

From the table above:

The value of chi-square for all phrases in the first hypothesis (399.64), with (p-value = 0.000 < 0.05) and depending on the table (4.6), this indicates that there is significant differences at the level (5%) between answers of study individuals.

## Second Hypothesis:

For leadership, Africa City of Technology is ready for implementation

Table (4.8) shown the answer of the respondents to the second phrase of the study hypothesis

No.	Phrases	Frequency				
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Incubator's policy is clear to you.	36	80	12	4	0
2	The commitment of top management is clear through the policy.	41	70	41	0	0

Source: prepared by researcher, using SPSS, 2019

Table (4.9) shown Chi-square test results:

No.	Phrases	Chi-square value	P-value	Median	Trend
1	Incubator's policy is clear to you.	106.1	0.000	4	Agree
2	The commitment of top management is clear through the policy.	27.6	0.000	4	Agree
Hypothesis		149.34	0.000	4	Agree

Source: prepared by researcher, using SPSS, 2019

The value of chi-square for all phrases in the second hypothesis (149.34), with (p-value = 0.000 < 0.05) and depending on the table (4.8), this indicates that there is significant differences at the level (5%) between answers of study individuals.

### **Third Hypothesis:**

In term of planning management system, Africa City of Technology is well prepared

Table) 4.10) shown the answer of the respondents to the third phrase of the study hypothesis

No.	Phrases	Frequency				
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	There are actions to address the risks.	16	73	29	14	0
2	There are actions to address opportunities.	17	78	28	9	0
3	The incubator's quality objectives are clear to you.	23	80	15	6	2

Source: prepared by researcher, using SPSS, 2019

Table) 4.11) shown Chi-square test results:

No.	Phrases	Chi-square value	P-value	Median	Trend
1	There are actions to address the risks.	68.7	0.000	4	Agree
2	There are actions to address opportunities.	87.3	0.000	4	Agree
3	The incubator's quality objectives are clear to you.	159.4	0.000	4	Agree
Hypothesis		339.14	0.000	4	Agree

Source: prepared by researcher, using SPSS, 2019

**From the table above:**

The value of chi-square for all phrases in the third hypothesis (339.14), with (p-value = 0.000 < 0.05) and depending on the table (4.10), this indicates that there is significant differences at the level (5%) between answers of study individuals.



## Forth Hypothesis:

The Africa city of technology in term of support is well prepared.

Table ( 4.12)shown the answer of the respondents to the forth phrase of the study hypothesis

No.	Phrases	Frequency				
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	The work environment is suitable for the staff.	26	72	15	15	4
2	There is a staff training plan.	16	88	19	7	1
3	There is staff appraisal.	22	31	41	22	16
4	There is a system of communication between different sections in incubator.	19	99	5	9	0
5	There is a meeting between the various sections within the incubators to discuss the negative impact from section to another	24	101	3	4	0
6	There is a meeting between the various sections within the incubators to discuss the positive impact from section to another.	17	85	26	4	0
7	You are in touch with the sections that affect your performance.	22	93	6	1	0
8	You are in touch with affected sections by you.	15	92	11	13	1

Source: prepared by researcher, using SPSS, 2019

Table (4.13)shown Chi-square test results:

No.	Phrases	Chi-square value	P-value	Median	Trend
1	The work environment is suitable for the staff.	107.62	0.000	4	Agree

2	There is a staff training plan.	190.03	0.000	4	Agree
3	There is staff appraisal.	40.09	0.000	3	Neutral
4	There is a system of communication between different sections in incubator.	179.15	0.000	4	Agree
5	There is a meeting between the various sections within the incubators to discuss the negative impact from section to another	195.33	0.000	4	Agree
6	There is a meeting between the various sections within the incubators to discuss the positive impact from section to another.	116.66	0.000	4	Agree
7	You are in touch with the sections that affect your performance.	219.13	0.000	4	Agree
8	You are in touch with affected sections by you.	208.15	0.000	4	Agree
Hypothesis		219.13	0.000	4	Agree

Source: prepared by researcher, using SPSS, 2019

**From the table above:** The value of chi-square for all phrases in the forth hypothesis (219.13), with (p-value =0.150> 0.05) and depending on the table (4.12), this indicates that there is significant differences at the level (5%) between answers of study individuals.

**Fifth Hypothesis:**

In regards to operations africa city of technology is well prepared for implementing.

Table (4.14)shown the answer of the respondents to the fifth phrase of the study hypothesis

No.	Phrases	Frequency				
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	There is a diagram of processes within the ACT incubators.	15	98	17	2	0
2	Externally provided processes, products and services are controlled.	13	65	38	3	0
3	There is a procedure for Controlling of nonconforming outputs.	14	65	40	4	0

Source: prepared by researcher, using SPSS, 2019

Table( 4.15)shown Chi-square test results:

No.	Phrases	Chi-square value	P-value	Median	Trend
1	There is a diagram of processes within the ACT incubators.	174.72	0.000	4	Agree
2	Externally provided processes, products and services are controlled.	77.54	0.000	4	Agree
3	There is a procedure for Controlling of nonconforming outputs.	73.33	0.000	4	Agree
Hypothesis		167.27	0.000	4	Agree

Source: prepared by researcher, using SPSS, 2019

**From the table above:** The value of chi-square for all phrases in the fifth hypothesis (167.27), with (p-value = 0.000 < 0.05) and depending on the table (4.14), this indicates that there is significant differences at the level (5%) between answers of study individuals.

### **Sixth Hypothesis:**

In term of performance evaluation and development, the Africa city of technology has the ability to progress well.

Table ( 4.16)shown the answer of the respondents to the sixth phrase of the study hypothesis

No.	Phrases	Frequency				
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	There are methods to measure and monitor the effectiveness of the QMS used in ACT incubators.	19	81	18	8	0
2	There are complaints from clients.	16	81	16	16	3
3	Complaints are monitored and discussed.	16	86	24	2	0
4	There is internal auditing in ACT incubators	13	89	16	8	0
5	There is Management review meeting.	13	107	4	7	1
6	There is clear plan for continuous improvement in service delivery.	16	92	11	9	1
7	There are methods to measure and monitor the effectiveness of the QMS used in ACT incubators.	1	10	9	5	0

Source: prepared by researcher, using SPSS, 2019

Table (4.17)shown Chi-square test results:

No.	Phrases	Chi-square value	P-value	Median	Trend
1	There are methods to measure and monitor the effectiveness of the QMS used in ACT incubators.	106.06	0.000	4	Agree

2	There are complaints from clients.	145.95	0.000	4	Agree
3	Complaints are monitored and discussed.	129.25	0.000	4	Agree
4	There is internal auditing in ACT incubators.	140.98	0.000	4	Agree
5	There is Management review meeting.	310.57	0.000	4	Agree
6	There is clear plan for continuous improvement in service delivery.	216.85	0.000	4	Agree
7	There are methods to measure and monitor the effectiveness of the QMS used in ACT incubators.	8.12	0.000	4	Agree
Hypothesis		538.63	0.000	4	Agree

Source: prepared by researcher, using SPSS, 2019

**From the table above:**

The value of chi-square for all phrases in the first hypothesis (538.6), with (p-value = 0.000 < 0.05) and depending on the table (4.16), this indicates that there is significant differences at the level (5%) between answers of study individuals

**Chapter five**  
**Conclusion and Recommendation**

## **5.1 conclusions:**

Base on the results obtained, and a discussion of the finding is presented in result and analysis. The findings from the study were used to discuss whether the proposed hypotheses are supported and the achievement of research objectives are determined.

The study are discussed based on analytical, descriptive and statistical approach and end with suggestions for future research.

- The study conclude that the ACT has the possibility and the reediness to apply the QMS to a good degree.
- The study conclude that with regard to the context of organization, ACT is fully prepared for implementation.
- The study conclude that for leadership, ACT is ready for implementation.
- The study proved that ACT, in term of support is well prepared.
- The study conclude that the ACT, in term of planning management system is well prepared.
- The study proved that the ACT, in term of performance evaluation and development has the ability to progress well

## **Discussion**

- **Comparison of the study with the scientific paper (Quality Management System for Small and Micro Enterprises)**

The study agrees with the scientific paper on the very important role that small and micro enterprises play in a country's economy in terms of income generation and employment.

They also agreed on the possibility of implementing the quality management system in business incubators, as the study tested 10 incubators in ACT and

the scientific paper tested seven micro and small enterprises located in the Jundiai business incubator.

The implementation of the quality management system in small and micro enterprises must be based on ISO 9001, as the study agreed with the scientific paper that the quality management system (ISO9001) is effective in relation to the proposed goals and the elimination of various administrative difficulties that may appear before its implementation.

- **The evolution of quality management systems to assist manufacturing entrepreneurs in incubation cluster.**

Quality management systems are important for any organization to sustain growth, develop technologies and to manage innovation. A quality management framework can assist to recognize the life cycle position of an incubation cluster and the phases to grow from a startup into established value streams.

In this study several manufacturing incubators in South Africa were visited to conduct an incubator quality management systems capability analysis.

The scientific paper emphasized the possibility of applying ISO 9001 to incubators and that the incubator with the ISO 9001 certification was able to implement its training programs and enterprise growth initiatives faster and more predictable

- The study agreed with the scientific paper (**Implementation of the Quality Management System Model in Hong Kong: a case study**) that QMS ISO9001-2015 will help overcome the difficulties and limitations facing the business of emerging companies and product development, and enhance the level of management skills and continuous improvement with the knowledge that the scientific paper tested 11 incubators



The results of the study revealed support the possibility of applying quality management system (ISO 9001-2015) in business incubators Case study: Business incubators at Africa City of Technology (ACT), according to the validity of the hypotheses that have been developed.

This study could be the first building block for Africa City of Technology business incubators to implement Quality Management System (ISO 9001-2015).

## **5.2 RECOMMENDATIONS:**

- Continues intensive training program for the staff in order to improve the quality management system culture at business incubators in Africa City of technology.
- Start a gap analysis of ACT

## **5.3 Limitation of the study**

- Shortage of sources and books references in this field
- The concept of business incubators new culture and not spread in Sudan

## **5.4 Suggestions for further researches:**

- Implementation of QMS At business incubators
- The impact of QMS At business incubators

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# Appendix

## Appendix 1

### INSTRUCTIONS:

For the following questions, please mark the closest answer to reality.

No.	Question	Strongly agree	agree	neutral	disagree	Strongly disagree
<b>First axis: context of the organization</b>						
1.	Internal issues have been identified in ACT business incubators.					
2	External issues have been identified in ACT business incubators.					
3	Interested parties have been identified in ACT business incubators.					
4	The scope of QMS has been define in ACT incubators.					
5	A clear Process approach has been established for ACT business incubators.					
<b>Second axis: Leadership</b>						
1	Incubator's policy is clear to you.					
2	The commitment of top management is clear through the policy.					

<b>Third axis: Planning for management system</b>						
1	There are actions to address the risks.					
2	There are actions to address opportunities.					
3	The incubator's quality objectives are clear to you.					
<b>Forth axis: Support</b>						
1	The work environment is suitable for the staff.					
2	There is a staff training plan.					
3	There is staff appraisal.					
4	There is a system of communication between different sections in incubator.					
5	There is a meeting between the various sections within the incubators to discuss the negative impact from section to another.					
6	There is a meeting between the various sections within the incubators to discuss					

	the positive impact from section to another.					
7	You are in touch with the sections that affect your performance.					
8	You are in touch with affected sections by you.					
<b>Fifth axis: Operation</b>						
1	There is a diagram of processes within the ACT incubators.					
2	Externally provided processes, products and services are controlled.					
3	There is a procedure for Controlling of nonconforming outputs.					
<b>Sixth axis: Performance evaluation and Improvement</b>						
1	There are methods to measure and monitor the effectiveness of the QMS used in ACT incubators.					

2	There are complaints from clients.					
3	Complaints are monitored and discussed.					
4	There is internal auditing in ACT incubators.					
5	There is Management review meeting.					
6	There is clear plan for continuous improvement in service delivery.					

## Appendix 2

تعليمات:

للأسئلة التالية ، يرجى وضع علامة على أقرب إجابة للواقع.

الرقم	السؤال	اوافق بشدة	اوافق	محايد	لا اوافق	لا أوافق بشدة
<b>المحور الأول: سياق المنظمة</b>						
1.	قد تم تحديد القضايا الداخلية في حاضنات الأعمال بمدينة افريقيا التكنولوجيه.					
2.	قد تم تحديد القضايا الخارجية في حاضنات الأعمال بمدينة افريقيا التكنولوجيه.					



					3. قد تم تحديد الأطراف المهمة في حاضنات الأعمال بمدينة افريقيا التكنولوجية .
					4. تم تحديد نطاق نظام إدارة الجودة في حاضنات مدينة افريقيا التكنولوجية .
					5. وقد تم وضع نهج عملية واضحة لحاضنات الأعمال بمدينة افريقيا التكنولوجية
<b>المحور الثاني: القيادة</b>					
					1. سياسة الحاضنة واضحة بالنسبة لك.
					2. التزام الإدارة العليا واضح من خلال السياسة
<b>المحور الثالث: التخطيط لنظام الإدارة</b>					
					1. هناك إجراءات لمعالجة المخاطر.
					2. هناك إجراءات لانتهاز الفرص.
					3. أهداف الجودة في الحاضنة واضحة لك.
<b>المحور الرابع: الدعم</b>					
					1. بيئة العمل مناسبة للموظفين.
					2. هناك خطة تدريب الموظفين.
					3. هناك تقييم للموظفين.
					4. هناك نظام للتواصل بين الأقسام المختلفة في الحاضنة.
					5. هناك اجتماع بين الأقسام المختلفة داخل الحاضنات لمناقشة التأثير السلبي من قسم إلى آخر.
					6. هناك اجتماع بين الأقسام المختلفة داخل الحاضنات لمناقشة التأثير الإيجابي من قسم إلى آخر.
					7. أنت على اتصال بالأقسام التي تؤثر على أدائك.

					8. أنت على اتصال بالأقسام المتأثرة بواسطتك
<b>المحور الخامس: العملية</b>					
					1. يوجد رسم تخطيطي للعمليات داخل حاضنات الاعمال لمدينة افريقيا التكنولوجية.
					2. يتم التحكم في العمليات والمنتجات والخدمات المقدمة من الموردين .
					3. يوجد إجراء للتحكم في المخرجات غير المطابقة.
<b>المحور السادس: تقييم الأداء وتحسينه</b>					
					1. هناك طرق لقياس ومراقبة فعالية نظام إدارة الجودة المستخدم في حاضنات مدينة افريقيا التكنولوجية.
					2. هناك شكاوى من العملاء.
					3. يتم مراقبة الشكاوى ومناقشتها.
					4. هناك تدقيق داخلي في حاضنات مدينة افريقيا التكنولوجية .
					5. هناك اجتماع مراجعة الإدارة.
					6. هناك خطة واضحة للتحسين المستمر في تقديم الخدمات.

### Appendix 3

Adjustors:

1. Abdul Razeq Abdullah Albouni
2. Ashraf Hassan
3. Muhannad Hassan Ismail



بسم الله الرحمن الرحيم

الدكتور: عبد العزيز بن علي بن عبد الله البوي

السلام عليكم ورحمة الله وبركاته

اما بعد

الموضوع: طلب تحكيم استبيان

بالإشارة للموضوع اعلاه و في سبيل الحصول على درجة الماجستير في ادارة الجودة والامتياز اتقدم  
( تطبيق نظام ادارة الجودة في حاضنات شاكرا بطلب تحكيم الاستبيان المرفق و المصمم لدراسة بعنوان  
مدينة افريقيا التكنولوجية ).

ولكم فانق الشكر والاحترام

الباحثة : سماح عمر علي

باشراف: د. عبدالمنعم بشير

٢٠١٩/٢/٢٥

عبد العزيز بن علي بن عبد الله البوي  
استاذ في قسم المحاسبة  
عميد لمادة التسويق وخدمة

بسم الله الرحمن الرحيم  
الدكتور: .....  
السلام عليكم ورحمة الله وبركاته

اما بعد

الموضوع: طلب تحكيم استبيان

بالإشارة للموضوع اعلاه و في سبيل الحصول على درجة الماجستير في ادارة الجودة والامتياز اتقدم  
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مدينة افريقيا التكنولوجية ).

ولكم طائق الشكر والاعتناء

الباحثة : سماح عمر علي

باشراف: د. عبدالمنعم بشير

بسم الله الرحمن الرحيم

الدكتور:.....

السلام عليكم ورحمة الله وبركاته

اما بعد

الموضوع: طلب تحكيم استبيان

بالإشارة للموضوع اعلاه و في سبيل الحصول على درجة الماجستير في ادارة الجودة والامتياز اتقدم  
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مدينة افريقيا التكنولوجية )

ولنحو فائق الشكر والامتنان

الباحثة : سماح عمر علي

باشراف: د. عبدالمنعم بشير

د. محمد حسن اسحق

