

# **Chapter 1**

## **Introduction**

### **1-1 General**

In a rapidly changing, at global economy small firms, increasingly a force for enhancing policies and programmes addressing small and medium enterprises (SMEs). Past studies have shown that job creation and small and medium enterprises are closely linked. The findings of a study by (birch 1987),conclude that as many as two-thirds of the new jobs created in the U.S.A economy were created by firms with 20 or fewer employees, and that 80% were created by business with fewer than 100 employees.

These findings and these studies have prompted a good deal of interest in providing small business as an effective method of economic development. In Sudan, small businesses are the largest job –creation segment of our economy, and have become, a dynamic backbone of the Sudanese economic system.

The term (incubators) describes a variety of methods that are used in economic development to the nurture new, small business (young 2001).Primary business incubators were the instrument of urban renewal and community development. Organization, offers a range of business development services, and access to small space on flexible terms, to meet the needs of new firms. The package of services offered by a business incubator is designed to enhance the success and growth of new enterprises, thus maximizing their impact on economic development. Though business incubators are seen as a viable economic development tool, yet their success has not been determined.

### **1-2 Importance of the Research**

Similar large, small companies required TQM to remain competitive. The market of today is no longer limited to the local market, but includes the global market.

These markets present new opportunities and neglecting them will be detrimental. The biggest threat however comes from newly industrialized countries.

They offer the same products and services often at the same quality but at lower prices. This trend in international trade increases imports, with the resultant closure of local enterprises that cannot compete. TQM emphasizes changing a company's culture, systems and procedures to ensure the continual improvement of process, systems and innovation in order to meet the challenges and demands of the market, competition, technology, customer and environment. TQM will give SMEs the competitive advantage [Davies 1991]. Constant changes in the business environment, such as new technology, competitors or ways of operating, have made it crucial for companies to be able to change and become better in order to sustain their business (Fine, 1998). As part of their work towards sustained business, many large organizations have adopted quality management (QM) [Sousa & Voss, 2002]. QM can be seen as number of principles with connected practices and techniques [Dean & Bowen, 1994]. Customer focus, continuous improvement, and teamwork are seen as core principles of QM [Dean & Bowen, 1994] and can be viewed as providing parts of the answers to organizations in terms of what to change and how. Core to the customer focus concept is finding out who the customers are, identifying their needs and expectations, and then fulfilling or exceeding these needs and expectations [Bergman & Klefsjo, 2010]. Consequently, continuous improvements are central for reducing current waste and meeting future changes [Bergman & Klefsjo, 2010]. QM in large companies is often adopted in the form of various initiatives such as “lean” [e.g. Modig & Ihlstrom, 2012], “Six Sigma” [e.g. Schroeder et al., 2008], or perhaps “the Company Production System” [e.g. Netland, 2012]. While QM has been widely adopted in large organizations, it is not as common in small and medium enterprises (SMEs) [Done et al., 2011], which can be defined quantitatively as companies with fewer than 250 employees [European Commission, 2005], or qualitatively as companies that include complete business functions and decision makings, while still being small enough to be managed by one or a few executives [Hollander, 1967].

This thesis considers the adoption of QM in SMEs. In particular, the thesis shows that difficulties in adopting QM in SMEs are caused less by content (in the form of practices and techniques) than by process of adoption [Hansson & Klefsjo, 2003]. Therefore, to Support the further development of QM in SMEs, this thesis focuses on the process of adoption. Such a contribution has relevance for both practice and research.

### **1-3 Relevance for Practice**

Increased competition has placed demands on SMEs to improve their operations [Yusof & Aspinwall, 2000]. Furthermore, not since the Second World War have times been as economically challenging for SMEs as they have since 2008 [Carson, 2012]. With rapidly changing conditions, SMEs must be able to monitor, understand and react to changes in their business environment [Grundstrom et al., 2012]. Large organizations are demanding that their SME suppliers work with systematic ways to improve their business and delivery precision [van der Wiele & Brown, 1998]. Many authors [e.g., Ahire & Golhar, 1996; Brue, 2006; Conner, 2009; Kumar & Antony, 2008] have maintained that QM would be valuable for SMEs as a way of improving, but that many attempts have failed. For example, an American study was conducted of 500 firms that considered themselves as practicing QM, approximately half of which were SMEs. Of these, one-third experienced benefits from QM while the other two-thirds had come to a halt before effecting much change [Ahire et al., 1996]. It has been argued that some organisations have rhetorically claimed to work with QM but have not actually adopted any of the related practices and have therefore failed to reap any benefits [Zbaracki, 1998]. Another offered explanation of why adoption attempts fail is that while practitioners and researchers have treated QM as universally applicable, QM would benefit from a more context-based approach [Sousa & Voss, 2002]. [Ahire and Golhar, 1996] noted that SMEs cannot “blindly copy” QM work in large organisations, and that individual SMEs’ relative strengths must instead be exploited in the adoptions. [Hansson and Klefsjo ,2003] claimed that basic ideas of QM that work in large companies also work in SMEs, and that failed

adoption attempts can mainly be attributed to poor adoption efforts rather than flaws in the concept's content. One of the general difficulties for SMEs is the scarcity of resources [financially, but also in competences; see also e.g., [Bridge et al., 2003; Rahman & Tannock, 2005]. Consequently, external support (in the form of programmes, for example) has been suggested as a potential solution for some SMEs aspiring to adopt QM [Done et al., 2011; G.L. Lee & Oakes, 1995]. In summary, SMEs need better advice regarding how to adopt and adapt QM in their specific contexts. Therefore, there seems to be a practical need for better advice on how to succeed with adoption of QM in SMEs, including how external interventions can support such processes.

#### **1-4 Relevance for Research**

Unfortunately, while large companies have received the bulk of research attention, there is a general shortage of literature focusing on SMEs [Done et al., 2011; Prater & Ghosh, 2006], and therefore also of QM in SMEs [Ryan & Moss, 2005; Yusof & Aspinwall, 2000]. The literature on QM in SMEs has tended to focus on aspects such as specific characteristics of SMEs compared to large companies [Ghobadian & Gallea, 1997], the application of certain quality practices [Kuratko et al., 2001], and ideas for critical adoption factors [Yusof & Aspinwall, 2000]. Some studies have been generic, suggesting important factors with little regard for different organisational contexts [Assarlind & Gremyr, 2014]. This could be partly explained by the fact that most of these previous studies have been conceptual or survey-based [Assarlind & Gremyr, 2014], with a lack of case studies [Achanga et al., 2006]. This is unfortunate, since in depth studies are crucial for understanding adoption processes in different contexts, which is something that survey studies cannot achieve [Rogers, 2003; Wolfe, 1994]. There is a need to understand the different needs of an organisation during the different parts of an adoption process. Many extant studies have discussed critical factors in terms of *what* is seen as important in an adoption process, but there is also merit in discussing *when* and *where* these factors are important. [Sousa and Voss, 2002, p. 105] made a similar argument in claiming that

what research on QM “has as yet failed to produce are guidelines on what practices should be emphasized by organizations at difference stages of QM maturity and on what might be the best QM practice implementation sequence to reach the end result. On the other hand, the ‘how to do it’ research stream has taken for granted that all QM practices are universally applicable.” They further maintained that there is a need to “contribute to structuring the current chaotic wealth of QM implementation advice and to producing more solid and useful advice to managers” [Sousa & Voss, 2002, p. 106]. Therefore, there seems to be an academic need to better understand the QM adoption process and to structure and contextualise research on adoption of QM in SMEs.

### **1-5 Statement of the Research Problem**

Against the above background, the research problem within the ambit of this research reads as follows: - The lack of successfully implementation of Total Quality Management (TQM) in Sudan SMEs is culminating in degradation of the quality of the industry.

### **1-6 Purpose and Objectives**

The main goal of the research study is to examine the role of business incubators in encouraging entrepreneurship and innovation among fresh graduates in Sudan. It also aims at fulfilling the following objectives:

- 1-To determine the constraints to TQM implementation.
- 2-To determine the relationship between the planning behavior and the lack of TQM implementation.
- 3-To determine the relationship between the accreditation process and lack of TQM implementation.
- 4-Identify the business fields, level of awareness, most important (key) services to be provided by business incubators.
- 5-Identify and describe the most important training fields to be provided, suitable relationship, suitable exit criteria, and most suitable place for holding the incubator from the perspective of students.

6-Identify and describe the challenges (obstacles) facing business incubators in recommendations to tackle those obstacles.

7-Examine the level of entrepreneurial knowledge and skills among entrepreneurs in Sudan.

Also this research studies the adoption of TQM in SMEs from the perspective of individual organisations, but also from a programme perspective (that is, programmes designed to support TQM in SMEs).

### **1-7 Research Limits**

The term SME comprises everything from a manufacturing company with hundreds of employees to a service organisation with a handful of staff or even a one-person operation [European Commission, 2008]. Therefore, in order to delimit the research, this research will study also four other incubators property to Sudan University of Science and Technology. Furthermore, start-ups are excluded since such companies often face quite different issues than more mature companies. The companies studied in this research have all been around for a few years and have established business relationships. In addition it is not possible to cover all aspects in this subject, consequently the research is limited to the three chosen area, incubator management, accounting management and financing. Further, there is a fourth area named other difficulties apart from the three area mentioned above.

### **1-8 Research Hypotheses**

There are four hypotheses the researcher discuss them demonstrated as below:

- 1.SMEs managers do not understand the definition or implications of TQM.
- 2.SMEs managers can be encouraged to implement TQM by a combination of training and mentoring.
- 3.It is possible to benchmark management styles and the relative position of a company on route to TQM using the biological classification system.
- 4.The greater focus on shared services provided by incubators, the more success.

## **1-9 Research Questions**

Research questions have been identified as:

- 1- What are the effects of successful implementation of TQM on the companies' financial performance?
- 2- What aspects are of importance for succeeding with a TQM implementation considering the required organization change?
- 3- How have small organization worked that successfully implemented TQM and what problems have emerged during the implementation process?
- 4- How is quality management work organized, and what are the TQM components in small organizations that have implemented TQM?
- 5- How going to generate knowledge regarding SMEs towards TQM?

## **1-10 Appropriateness of the Research Instruments and Measures**

As design research was discovered, it became evident that the ontology and epistemology of design research, as defined by [Hevner et al ,2004], seems to correspond with the science in scientific management and consequently with the science implied in management science (operations research) and quality management methods in general. In other words, the choice of design research appears to be a useful approach for the type of knowledge we expect to produce by doing the type of studies illustrated in this thesis. Criteria should be the principle of TQM.

## **1-11 Research Design & Methodology**

This research presents case studies conducted at technology incubators, as well as a case study TQM work. The researcher present a cross-case analysis of four other incubators that participated in the same field, as well as the design of a well recognized national transformation programme for small & medium-sized manufacturing enterprises (SMEs). The frame of this research considers these empirical studies jointly.

Case study research mainly falls in the qualitative research paradigm, but it could also be applied within the quantitative research paradigm.

## **1-12 Expected Results**

This research will be very beneficial to different parties and actors inside and outside Sudan as demonstrated in the following:

1-Deployment of the culture of the TQM.

2-Top management is compulsory to implement TQM.

3-Encouraging implementing of TQM by combination of training and monitoring.

4-Growth in the financial performance

5-Realize customers satisfaction

6-Realize employees satisfaction

7-Wholesome in the Sudanese economy.

8-Encourage decision makers to reliance on TQM.

9-Small business and private sector will depend on TQM.

10-Appropriate measures are developed for learning and growth.

11-Improve the quality and less the rework in job.



## **Chapter 2**

# **Total Quality Management**

### **2-1 Introduction**

In today's highly competitive business environment, a company's capability to sustain its competitive advantage is crucial for the continuity of the business [Calingo, 1996]. Quality is the most important factor for sustaining the competitive advantage. It is the measurement of how well a company can meet or exceed its customers' requirements and expectations [Oakland, 2003]. Competition is extremely high in a free market. The market supports that customer satisfaction is essential in a free market due to the following reasons:-

- The products or services from the service providers are similar;
- Customers within the market are price-sensitive;
- Customers have stronger bargaining power as the cost to switch to another service is considered as low. SMEs industry has strong market competition; therefore, customer satisfaction and retaining loyalty will be crucial for their success.

### **2-2 The Origins of Total Quality Management**

According to [Mote 2009:Online], although TQM techniques were adopted prior to World War II by a number of organisations, the creation of the total quality management philosophy is generally attributed to [Dr. W. Edwards Deming, 1900-1993]. In the late 1920s, while working as a summer employee at Western Electric Company in Chicago, Deming found worker motivation systems to be degrading and economically unproductive; incentives were tied directly to quantity of output, and inefficient postproduction inspection systems were used to find flawed goods.

Deming teamed up in the 1930s with [Walter A. Shewhart 1891-1967], a Bell Telephone Company statistician whose work convinced Deming statistical control techniques could be used to support traditional management methods. Using

Shewhart's theories, Deming devised a statistically controlled management process that provided managers with a means of determining when to intervene in an industrial process and when to leave it alone. Deming was availed the opportunity to put Shewhart's statistical quality-control techniques, as well as his own management philosophies to the test during World War II. Government managers found that Deming's techniques could easily be taught to engineers and workers, and then quickly implemented it in overburdened war production plants [Mote, 2009: Online]. According to [Kujalo, 2002:33], the origin of total quality management can be traced back to 1949, when the union of Japanese Scientists and Engineers (JUSE) formed a committee of scholars, engineers, and government officials devoted to improve Japanese productivity and quality of life. TQM is general considered Japanese industry practices, which are heavily influenced, by Deming (1986) and Juran (1993) [Kujalo 2002:33]. Three-quality theorist were whose work influenced the quality planning processes initiated by U.S. business was: W. Edwards Deming (1986), Joseph M. Juran (1993), and Phillip B. Crosby (1979) [Lankard, 1992:125]. According to [Goh and Ridgway, 1994:54], and [Krasachol,Willey and Tannock, 1998:40-44], the concept of TQM is based from the work of the quality guru's, Deming (1986), Crosby (1979), Feigenbaum (1991), and Ishikawa (1985). Their particular areas of focus are summarised below:

- Management leadership and employee participation in the new philosophy [Deming, 1986]. Make quality the concern of everyone in the company [Crosby, 1979 & Feigenbaum, 1991].
- Emphasis on meeting the requirement of both the internal [Crosby 1979, Feigenbaum, 1991], and the external customer (Ishikawa, 1998).
- Eliminate non-conformance, appraise conformance to standards, have zero defects standards of performance (Crosby, 1979). Reduce cost of appraisal, prevention, and failure (Feigenbaum, 1991).

- Use statistical and quantitative control methods. Implement problem solving using quality control circles, Shewart /PDCA cycle and quality assurance [Ishikawa, 1985, and Deming, 1986].

- Search continually to improve processes and products (Deming, 1986). Develop new products and processes; quality is a continuous programme [Crosby, 1979 & Feigenbaum, 1991 cited by Goh & Ridgway, 1994:54 and Krasachol *et al.*, 1998:40-44]. According to Spanbauer and Hillman (1987) cited by Lankard [1992:125], Deming (1986), Juran (1993) and Crosby (1979) have a common theme namely, participatory management that involves input, problem solving and decision making by all members of an organisation and its customers. The three themes of each of the authors are discussed below [Lankard, 1992:125].

**Deming (1986):** Promotes the role of management as one of facilitating workers to do their best by removing the barriers that prevent high quality work and by involving workers in decision making. This theory emphasizes process improvement as crucial to product improvement [Lankard, 1992:125].

**Juran (1993):** Suggests that management problems are related to human element errors. The theory promotes management training in quality concepts and the use of quality circles to improve employee communication across levels. Juran's theory furthermore focuses on understanding customer needs [Lankard, 1992:125].

**Crosby (1979):** Promotes a prevention process whereas requirements for quality conformance are jointly written by managers and workers and address the needs of the customers, Crosby's theory focuses on zero defect standards in which the cost of non-conformance to the standards are eliminated [Lankard, 1992:125]. Emphasizes that although these theories focuses on specific themes, they are reflected in a general way in Crosby's model, which present four pillars that support the quality process in any organization [Lankard, 1992:125]. According to [Goh and Ridgway, 1994:54], there are five components, or pillars of TQM, all of which are paramount for the complete establishment of TQM in a company, namely:

- Management commitment,

- Customer focus,
- Quality costs,
- Quality systems, and
- Continuous improvement (increase growth and profitability)[Ridgway, 1994:54]. Each of the TQM pillars is elaborated upon below:

**Management commitment**\_Management commitment is essential for a company to implement TQM successfully as resources and management leadership is required.

**Customer focus: Requires the following elements**

- Customer survey and trials.
- Working closely with key customers.
- Competitor analysis.
- Analysis of customer complaints and compliments.
- Trade survey and trials.

**Quality costs**\_Cost is incurred ensuring that products and services meet the customer requirements.

**Quality systems** Any company can develop its own quality system to ensure that its principles, processes, and procedures are appropriate and adequate for its business operation.

**Continuous improvement** This is continual search for excellence and customer satisfaction (increase growth and profitability) [Goh and Ridgway, 1994:56].

**2-3 The Concept of Total Quality Management**

According to [Lozano 1997:148], the concept TQM represents the timeline of the old and new concepts of quality. The concept of quality has existed for many years though its meaning has changed over years. In the early twenties, quality management meant inspecting a product to ensure that it met with the specification. In 1940's, it become more statistically based, while in the 1960's, quality took a broader meaning and the concept began to be viewed as something that encompasses the entire organisation. Since the 1970's, quality was used as a competition base, with

companies focusing more on improving quality in order to be more competitive [Lozano, 1997:148].

TQM is one of the most important management innovations of the 20th century, and it has more influence on contemporary management practices than any other management movement [Kujalo, 2002:8]. According to [Lankard ,1992:125], TQM is a concept introduced by business and industry to establish standards and techniques that ensures the quality of products leaving and reaching firms through continuous action rather than through one final inspection. TQM is a philosophy in its own right embracing many areas. With, high emphasis on training, continuous improvement, loyalty and commitment, teams and quality circles, statistical process control and (Just In Time) (JIT) production. [Parkin ,1996: 6], views the TQM approach as a “...continuous improvement that comes about by involving everyone in a company, from the boardroom to the mailroom, in a daily search for incremental improvements”. [ Mersha ,1997:164-183], views TQM, “as an approach to doing business that attempts to maximize the competitiveness of an organization through the continual improvement of the quality of its products, services, people, processes, and environments”.

Furthermore according to [Mersha ,1997:164-183], TQM provides, customers with defect free products and service. Although, the ultimate goal is to satisfy external customers, TQM recognizes that it will be difficult to satisfy external customers without meeting the requirements of internal customers as well. Therefore, it seeks to meet or exceed the expectations of both internal and external customers [Mersha, 1997:164-183)]. According to [Martin and Saygili ,2001: Online], quality is the key factor in improving a company’s competitiveness in local and international markets, and for long-term survival.

TQM is a state of mind and a philosophy, rather than specific set of procedure or methodology. Moreover, TQM ensures that organisational performance is maximized with the sharing of knowledge within a culture of continual learning, innovation, and improvement [Martin & Saygili, 2001: Online]. TQM refers to the method used to

enhance quality and productivity in an organisation [Gunasekaran, 1999 cited by Hughes 2006: Online]. TQM is a comprehensive systems approach that works horizontally across an organization involving all departments and employees including suppliers and customers [Kurtus, 2007: Online].

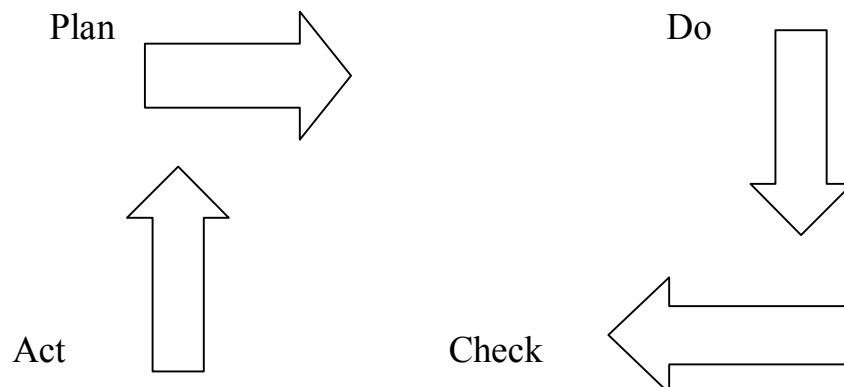
Unlike ISO9000:2000, TQM is not defined by international standards and there is no single correct way to implement TQM processes. It can be an approach to business, or even a philosophy or a state of mind, shared by management and staff [Tannock, Krasachol & Ruangpermpool, 2002: Online]. According [Williams, 1997: Online], TQM can be defined as a holistic management philosophy that seeks continuously to maximize customer satisfaction and continually to identify and eliminate non-value adding activities from the organisation. TQM is a management philosophy for continuously improving quality of goods and service delivered through participation of all organisational members; it is a process of making quality a concern of everyone in the organisation [Zealelem & Getachew, 2002:3]. The TQM philosophy emphasises lower costs by reducing waste, helping suppliers provide quality products, and satisfying the customer with quality goods and services.

Furthermore, TQM foster organisational performance characterized by competitiveness and long-term profitability [Hansson, 2002:12]. Currently TQM is an accepted practice within enterprises regardless of size and financial status [Hodgetts, 1996: Online cited by Hansson, 2002:12].

TQM is considered by many organisations to be a management paradigm capable of facilitating the attainment of continuous process improvement and external focus [Gobadian & Gallear, 1997: Online]. According to [Psychogios and Priporas ,2007: Online], TQM is in contrast to other quality management initiatives, It involves everyone in an organisation and the overall participation to quality strategy brings an increase flow of information and knowledge. Furthermore, it contributes in the distribution of intelligence to the bottom of the organisation for resolving problems [Powell, 1997 cited by Psychogios & Priporas 2007: Online]. TQM is an essential way of organising, and involving the whole organisation. [Oakland, 1998 cited by

Psychogios & Priporas, 2007: Online]. In addition, the best way to improve organisation output is by continually improve performance [Dale, 1996, Goetsch & Davis, 1994, Ho & Fung, 1994 cited by Psychogios & Priporas, 2007: Online].

According to [Psychogios and Priporas ,2007: Online, citing Dale ,1996], the emphasis on seeking improvement opportunities, in addition focusing on planning, prevention, and participation requires the development of generations of managers who are dedicated to continuously improve the internal and the external customer needs. According to [Foster, 2001:28], PDCA (Plan-Do-Check-Act) describes the activities a company needs to perform in order to incorporate continuous improvement in its operations. The concept represents a cycle that consists of a four-stage checklist that coordinates organisations continuous improvement efforts. The PDCA Cycle is commonly referred to as the Shewhart cycle or Deming Wheel. The nature of this cycle indicate that continuous improvement is never ending process (Refer Figure 1)



**Figure 1: The PDCA CYCLE**

[Source: Adapted from Foster, 2001:28]

According to [Foster ,2001:28], the four stages of the PDCA Cycle describe the activities an organisation needs to perform in order to incorporate continual improvements in its business processes. The specific steps in the PDCA cycle are elaborated upon:

- **Plan:** Organisations need to determine where the problem areas are.
- **Do:** Testing on a small scale in order to check whether the changes are solving the problems

- **Check:** Check whether the results from the above testing are delivering the desired improved outcome.
- **Act:** Once the organisation is satisfied with the outcome of the testing, then it should be implemented on a large scale.

## 2-4 Total Quality Management Principles

The principles of TQM and quality function deployment can assist in developing objectives and measures. Furthermore, resources and strategic planning areas which require focus can also be identified [Vasudeva, 2009: Online].

According to [Goh and Ridgeway, 1994:54], TQM hold that the customer is the most important factor in any organisation. TQM is not merely about implementing dynamic management systems; it is also about embedding a culture of continuous improvement and customer focus within an organisation. In addition [Williams, 1997: Online], provide the following basic principles of TQM, namely:

- Performance measurement.
- Customer orientation,
- Continuous improvement,
- Employee involvement,
- purchasing and supplier management

The above principles are expanded upon below:

- **Performance measurement:**

Whether at the organisational, departmental, or individual level, are the values that enable management to effectively plan, monitor, and control and make decisions within an organisation. According to [Williams, 1997: Online], the performance measures in a TQM environment should be linked to the achievement of organisational and TQM objectives. These measures also need the ability to support a proactive management style.

- **Customer orientation**

Focus on the customer is a critical element of TQM. An organisation must continually and actively conduct market research and measure customer satisfaction.



In addition, this information must be utilized in the design of the organisation's products and services.

- **Continuous improvement**

The aim of continuous improvement is continuously to identify and eliminate those activities that add little or no value to the product or service provided, i.e. waste. Several categories of waste have been identified. In addition to these classifications, the waste of human potential is also considered. Continuous quality improvement (CQI) has emerged as a dominant theme for survival and growth in today's fiercely competitive business environment [Prybutok & Ramasesh, 2004: Online].

- **Employee involvement**

To progress towards TQM, it is essential that the abilities and experience of all employees are utilized. Most work and customer contact takes place at the lower end of the organisation. As a result, these employees are the most likely source of improvements within the organisation. TQM also requires that there are clearly defined methods of gaining employee involvement and that the way in which the performance of employees is measured, is in terms of meeting the objectives of TQM and the organisation.

- **Purchasing and supplier management**

The output of any process is dependent on the nature of its inputs. When an organisation is viewed as a single process, the impact of supplied products and services becomes apparent. As a result, a TQM environment requires that purchasing decisions are made with quality (i.e. fitness for purpose) as the main determinant. Supplier relations should progress in the direction of supplier partnerships that embrace the following principles:

- Both parties are to benefit from the relationship.
- Both parties should seek to improve quality.
- The number of suppliers used should be minimized.
- There should be an intention to form long-term relations.

The aim is to integrate suppliers into the organisation's TQM process. The measurement of supplier performance should also be linked to the achievement of TQM and organisational objectives [Williams, 1997: Online].

According to [Mc Adam, 2000: Online, citing Ghobadian and Gallear ,1996, and Wiele and Brown ,1998], TQM principles are sufficiently generic that they can be applied in both large and small organisations. [Mc Adam ,2000: Online], discusses a five point base framework which is mention above in elaborated and encompasses the principles of TQM that could be used within a quality related model in the implementation of TQM in Small, Medium Enterprises (SME's): Quality management principles as defined by [Goetsch & Davis (2002:5-7)].

**Table 1 Quality management principles:**

No	Principles	Description
1	Customer focus	Understanding their needs, striving to exceed their expectations.
2	Leadership	Establishing direction, unity of purpose, and a supporting work environment.
3	Involvement of people	Ensuring that all employees at all levels are able to fully use their abilities for the organization's benefit.
4	Process approach	Recognizing that all work is done through processes, and managed accordingly.
5	System approach	Expands on the previous principle in that achieving any objective requires a system of interrelated processes.
6	Continual improvement	As a permanent organizational objective recognizing and acting on the fact that no process is so good that further improvement is impossible.
7	Factual approach	Acknowledge that sound decisions must be based on factual data and information.
8	Mutually beneficial supplier relationships	Synergy can be found in such relationships

[Source: Goetsch & Davis, 2002: 5-7].

The above principles are drawn from Total Quality Management (TQM), and have been included in the revised standard (International Organization for Standardization),(ISO9000:2000). In addition ISO considers the following as major changes in the revised standard.

- 1-Increased focus on top management commitment.
- 2-Customer satisfaction.
- 3-Emphasis on processes.
- 4-Continual improvement (ISO90001-2000)

## **2-5 TQM is a Strategically Linked to the Business Goals:**

- Strategy must be linked to resources and infrastructure.
- There is a need for a systematic measurable process to implement strategies.
- The link between strategy and business improvement must be clear.
- A mechanistic inflexible approach must be avoided.
- Approaches must cope with rapidly changing environments and be adaptable.
- The focus must be wider than simply financial.
- There must be adequate short-term benefits in addition to long-term potential.
- All improvement initiatives must be synthesized, because of scarce resources.

### **Customer understanding and satisfaction are vital.**

- A wider range of products and services could be developed.
- The customer focus is not subsumed within the financial focus.
- There is no substitute for a close customer relationship.
- Nothing can replace talking to the customers.
- The mechanisation approach must not replace the flexibility within personal relationships with customers.
- Improved target setting for markets and customers.

### **Employee participation and understanding at all levels are required.**

- There is an increase focus on training and development.
- There is an increased emphasis on helping employees learn, innovate, and improve.
- Employees are recognized as source of innovation.
- Appropriate measures are developed for learning and growth.
- Reward and recognition for employee's efforts.
- The danger of unhealthy focus on employee akin to Taylorism.
- The need for careful communication to employees.
- Balancing the flexible demands of the job with the relatively inflexible

### **The Need for Management Commitment and Consistency of Purpose.**

- The strong central focus SME management and implementation.

- Management commitment is vital.
- Learn to create future value as well as short-term gain.
- It is difficult to convince SME managers about long-term goals in a fast changing environment.
- Managers must avoid using the balance scorecard as a tool against employees.
- The balance scorecard can have an overly dominant effect on an SME.
- Long implementation time is a test of management resolve.
- Managers must communicate regularly and effectively.
- Managers should allocate appropriate resources, training, and development.

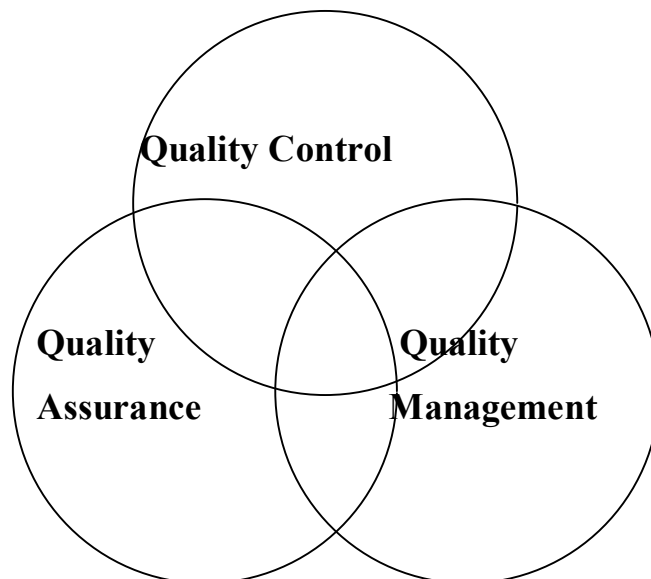
### **The Importance of Process Measurement.**

- Processes and measurements must continuously align with strategy in a fast moving environment.
- There is a danger of developing too many measurements.
- There is a constant tension between the need for flexibility and constraints of processes and measures.
- SME's prefer doing rather than measuring.
- Considerable scarce resources are required to capture measurements on an ongoing basis.
- Training and development are needed for effective process management.
- Targets can be established for processes.
- Process benchmarking can help overcome the parochial nature of SME's

The principles of TQM are to seek to satisfy the external customer with quality goods and services, as well as the internal customers. In addition the principles are aimed to satisfy external and internal suppliers and continuously improve processes by working smarter and using special quality methods [Kurtus, 2001: Online]. Not only does TQM encompass the entire organisation, but it stresses that quality is customer driven, characterized by focusing on identifying the root cause of problems and correcting them at source, as oppose to inspecting the final product after it has been made, [Lozano, 2003:147]. According to [Baidoun and Zairi, 2003:1, citing

Crosby, 1979, and Oakland, 2000], quality is an important consideration for executive management. The increased awareness of senior executives, who recognizes that quality is an important strategy, will in return result in all levels of the organisation focusing on the importance of quality.[Williams ,1997: Online], lists four basic principles of TQM, namely:

- **Performance measurements:** Are the values that enable management to effectively plan, monitor, and make decision within organisation.
- **Customer orientation:** An organisation must continually and actively conduct market research and measure customer satisfaction.
- **Continuous process improvement:** Identifies and eliminate those activities that add little or no value to the product or service
- **Employee involvement:** It is important that the liability and experience of all employees are utilized. [Foster, 2001:23], is of the opinion that the essence of quality management can be defined with the aid of the three spheres of quality namely, quality control, quality assurance and quality management. The terms ‘quality management’ ‘quality control’ and ‘quality assurance’ are often used interchangeably, regardless if the function is directly responsible for the continual evaluation of a system [Weiss & Gershon, 2008: Online]



**Figure 2: Three Spheres of Quality**

[Source: Adapted from Foster, 2001:23]

‘Quality Control’ involves monitoring capability, measuring performance, reducing variability and maintaining control charts. ‘Quality Assurance’ in turn, relates to guaranteeing the quality of products or services, while ‘Quality Management’ is the ‘adhesive’ that keeps the control and assurance activities:

- Quality Control
- Quality Assurance
- Quality Management together.

From the above, the analogy can be drawn that management is an important factor in assuring quality within organisations. According to [Weiss and Gershon, 2008: Online, citing Deming, 2000], the following principles are the cornerstones of total quality management philosophy, namely:

- Policy, planning, and administration.
- Product design and design change control.
- Control of purchased materials.
- Production quality control.
- User contact and field performance.
- Corrective action.
- Employee selection, training and motivation.

According to [Kelce and Lee, 2004: Online, citing Lee, 1998], there are nine elements of TQM, which can be identified, validated and established, namely:

- Customer focus,
- Top management commitment,
- Quality data and reporting,
- Training,
- Roles of quality department,
- Employee involvement,
- Process management,
- Product and service design, and
- Supplier quality management.

According to [Kelce and Lee, 2004: Online], the above nine elements of TQM are matched with four major principles for the successful implementation of TQM namely:

- Top management commitment,
- Employee involvement,
- Supplier participation
- And quality program.

The third and the fourth requirements map to the relationship with customers and suppliers. It is in these relationships that SME's may be disadvantaged when compared with large organisations, because they do not have as many resources or much influence. However, SME's may have an advantage over large organisations in the second requirement, as it is believed to be easy for SME's to get employees involved since most of the employees are more centralized and there are fewer lines of communication than in larger organisations [Kelce & Lee, 2004: Online]. According to [Williams, 1997: Online], there is evidence that the implementation of both TQM practice and ISO 9000 standards has influenced organizational performance. However, there seems to be no general agreement on how ISO and TQM are to be linked. Some researchers support the idea of starting with ISO as the first step towards TQM [Bradley 1994: Online], while others prefer to focus only on TQM.

## **2-6 The Reasons for a TQM Implementation**

According to [Zhang, Waszink, and Wijngaard, 2000:730-755)], writers such as Deming (1986), Crosby (1979), Juran and Gryna (1993), Feigenbaum (1991), Ishikawa (1985), and others have developed certain propositions in the area of quality management. Their insight into quality management provides a good understanding of quality management principles. Worldwide, there are several Quality Awards, such as the Deming Prize in Japan, the European Quality Award in Europe, and the Malcolm Baldrige National Quality Award in the USA. Each award is based on a perceived model of TQM. They do not focus solely on product, service perfection, or

traditional quality management methods, but consider a wide range of management activities, behavior and processes that influence the quality of the final offerings. These award models provide a useful audit or assessment framework against which organisations can evaluate their quality management methods, the deployment of these methods, and the end business results [Zhang *et al.*, 2000:2]. According to [Williams and Sussman ,2009:7], the ability to produce and deliver quality products and services in hyperactive competitive, global markets is no longer a high order goal achieved by few industry examples, rather a price of admission to compete. Furthermore, for an organisation to achieve excellence, it must seek and implement effective tools and techniques to transform quality from a concept, to an organisation-shared value embedded in the fabric of every part of the organisation [Williams & Sussman, 2009:7]. According to [Bardoel and Sohal ,1996: Online], the major benefit to a TQM implementation is to increase awareness and focus of all employees on satisfying internal and external customers. According to [Williams, 1997: Online], TQM implementation should be an opportunity to involve staff and review the processes and organisation operations. According to [Idris, Mcewan, and Belvendram, 1996:66-68], the main benefits of TQM had been improved customer satisfaction, teamwork, productivity, communication and efficiency. As long as TQM in an organisation is adopted fully and practiced effectively in an organisation, many advantages will be delivered. It will strengthen the organisational business performance and competitive advantage [Antony, Knowles & Gosh, 2002:551-566].

### **The Successful Implementation of TQM Will Result in**

- Improved Employee Involvement:** TQM ensures that everyone in the organisation has a clear understanding of what is required and how processes relate to the business as a whole. Through the practice of TQM, teamwork is employed and the employees are motivated and encouraged to control, manage and improve the processes, which are within their responsibility [Dale, 1994 cited by Antony *et al.* 2002:551-566].

- Improved Communication:** A better communication can be accomplished through the effective implementation of TQM principles in any organisation. More open and



frequent communication among people will be established, and they will view and treat one another as customers and suppliers [Anjard, 1998 cited by Antony *et al.*, 2002:551-566].

•**Increased Productivity:** TQM changes the organisational culture and creates a happy working environment. Due to effective delegation, empowerment, and total staff involvement, problems are identified and solved at lower levels. The working process will become more efficient. Consequently, productivity can be increased by reducing cycle times [Antony *et al.*, 2002:551-566].

•**Improved Quality and Less Rework:** Within the context of a TQM implementation, work processes and improvements are focused upon. Employees will place more emphasis on the elimination of root cause relines rather than the correction of problems. In addition, more up-front effort is applied to clarify requirements and prevent proactively the occurrence of defects and errors. Problems will be identified and tackled at lower levels, by the people closest to the work who are empowered to deal with the problems. As a result, the quality of the products/services will be improved and product rework will be reduced [Antony *et al.*, 2002: 551-566].

•**Improved Customer Satisfaction:** Through open communication among employees, customers and suppliers, the true voice of the customers can be more readily understood. Since quality operations also focus more on the work process and improvement, the company will provide a better quality product/service to the market. As a result, enhanced customer satisfaction is achieved.

•**Reduced Costs of Poor Quality:** Effective implementation of TQM will lead to significant reduction in costs of poor quality such as scrap, rework, late deliveries, warranty, replacement, etc. [Antony *et al.*, 2002: 551-566].

•**Improved Competitive Advantage:** A further, benefit is to strengthen the [Bardoel and Sohal ,1996:263], list the following benefits of a TQM implementation, namely:

- Better control of processes resulting in consistency from design to delivery.
- Reduced production time.

- Reduced damaged goods.
- Reduced delivery time.
- Decreased set up time.
- Increased performance measurements.
- Improved customer perception to company

According to [Kotelnikov, 2009: Online], there are five main advantages of an TQM implementation, namely:

- It encourages a strategic approach to management at the operational level, through involving multiple departments, in cross- functional improvement and systematic innovation processes.
- It provides a high return on investment through improved efficiency.
- It works equally well for the service and manufacturing sector.
- It allows organisations to take advantage of development that enables managing operations as a cross functional process.
- It fits an orientation towards inter- organizational collaboration and strategic alliances through establishing a culture of collaboration among different departments within organisations.

## **2-7 The Application of Total Quality Management within SME's**

Small and Medium Enterprises (SME's) play an important role in modern economies because of their flexibility and ability to innovate. In nearly every country, SMEs play a significant role in providing employment opportunities and supporting large-scale manufacturing firms [Gunasekaran, Forker & Kobus, 2000:316-336]. It is important for SME's to remain competitive as they are considered the lifeblood of a modern economy [Ghobadian & Gallear 1996: Online]. Furthermore, SME's do not only contribute to outputs and employment, they also affect the competitive power of large organisations [Mendes, 2002:16-19]. SME's are often suppliers of products and services to large organisations and therefore a lack of product quality and or service from SME's could affect the competitiveness of the larger organisation [Chileshe & Watson, 2000:Online]. TQM is considered as a way for SME's to improve the

quality of their products and services [Quazi & Padibjo, 1998: Online]. TQM as a philosophy is of particular importance to SME's operating in a developing region, since it can foster continual improvement through a systematic, integrated, consistency [Lewis, Pun & Lalla, 2005: Online]. The continuously growing competition on the market place has forced many SME's to start focusing on quality improvements and cost reduction in order to stay competitive [Wiklund, 1999: Online]. According to [Hughes, 2006: Online], there is potential to improve the competitive performance of small to medium sized companies (SMEs). In addition, TQM has been widely applied for improving competitiveness around the world [Samson & Terziovski, 1999:393]. Although the interest and the use to implement TQM continue to be high among large organisations, small organisations are still lacking behind in TQM implementation [Hansson, 2002:31]. Research has shown that TQM can be used by SME's with considerable success [Ghobadian & Gallear, 1996 cited by Zelealem & Getchew, 2002:184]. An introduction of TQM to SME's can help to sharpen SME market focus, to become more efficient, to harness their human resources better, and to improve their competitiveness [Ahire & Gohlar, 1996 cited by Zelealem & Getachew 2002:184]. According to [Tannock *et al.*, 2002: Online], the importance, of quality and the adoption of TQM in SME is not restricted to their relationship with larger customer. Furthermore, the adoption of TQM can help SME's to manage the transfer from incubation stage to maturity stage effectively, because the implementation of TQM creates as much stronger focus on customer needs and expectations. Furthermore, TQM creates effective and efficient business processes and the execution of skills to deliver low cost high quality products and services [Tannock *et al.*, 2002:1 Online]. [Hansson ,2002:5, citing Weish and White ,1981 and Haksever ,1996)], researched that small business have an advantage to adapt TQM principles, because they have a direct contact to customer requirements, and managers have total power to decision making. In addition, small business are believed to have an advantage over large organisation in implementing TQM, due to flexibility of their structure, innovation ability, lack of hierarchy

positions and strong organisational culture. Furthermore, TQM principles or techniques provide an excellent range of tools for measuring, analysing, and improving the performance of a process [McKenna, 1999: Online]. SMEs have a number of inherent advantages over large organisations, such as being closer to the customer, being more flexible in their operations, being able to be innovative, have more work force involvement and have more effective communication systems [Zealelem & Getatchew 2002:182]. According to [Mc Adam ,2001: Online], the potential advantage for SME's is their natural visibility and involvement of the managers, and if they are committed driving the TQM effort, then their approach will be visible and clear to all employees. According to [Hansson, 2002:4], small business enterprises intending to implement TQM, need an approach better tailored for the small organization context, and focused on changing process. One could expect that smaller organisations should experience less resistance to change, and would require less expenditure to implement and maintain TQM [Weish & White, 1981 & Haksever, 1996 cited by Hansson, 2002:5]. According to [Kelce and Lee ,2004: Online, citing Ahire and Golhar, 1996, and Lee ,1998], small companies are different from large companies in many areas, such as management style, production processes, available capital, purchasing practices, inventory systems and negotiation powers. Studies indicate that some elements of TQM and programs appear to be more compatible to SME's while TQM benefits are more significant to SME's [Chen, 1996 and Yan & Tang 1996 cited by Kelce & Lee 2004: Online]. Between a small business and a large business there are differences in structure, policymaking, procedures, and utilization of resources to the extent that the application of a large business concept directly to small business may not be advisable [Weish & White 1981, cited by Ghobadian & Gallear, 1996:Online]. There have been fewer studies examining the impact of TQM practices in small and medium enterprises. The conducted studies relied on management self assessment of performance [Watson & Kolber 2003:1]. Some TQM researchers argue that due to resource problems (mainly financial and human resources) TQM cannot produce consistent financial performance for SME's

[Schmidt & Finnigan, 1992; Powel, 1995; Strubering & Klaus, 1997 cited by Demirbag, Zaim, Tatoglu & Koh 2006:1206]. Another group of researchers however found some significant performance results of TQM practices in SMEs [Ahire & Golhar, 1996; and Hendricks & Singhal, 2001 cited by Demirbag et al., 2006:1210]. In comparing larger firms with smaller firms, [Demirbag et al., 2006: 1210 citing Hendricks and Singhal ,2001], argue that smaller firms tend to benefit more from TQM as compared to larger firms. This argument contradicts some of the earlier arguments on the role of TQM in SMEs (that TQM is less beneficial to smaller firms). For many of the measured direct relationships between quality and business financial performance, results were not significant, yet the relationship between quality and production/ operations outcome was significant [Adams, 1994:27].

## **2-8 The Lack of Total Quality Management within SME's**

According to [Lankard, 1992:4, citing Mc Commack, 1992], when TQM efforts do not meet expectations, it is often because of poor tactics and the lack of strategic frameworks. SME's implement ISO 9000 standards and TQM mainly due to market and customer demand [Bottomley, Dalrymple, Bushan, & Mietenen, 2009: Online]. SME's focus on informal, people- orientated approaches while large organisations are relatively more structured organised and process orientated [Cheng & Sun, 2002:421]. According to [Roberts and Thomson ,1995: Online], the reason why there is a lack of TQM implementation in SME's, is that as a rule, the responsibility for implementing TQM process, is given to quality manager or quality department. Not involving anyone in the organisation. In addition, TQM is not part of line management responsibility, or integrated into the strategic plan of the organization [Roberts & Thomson, 1995: Online]. According to [Mann and Kehoe ,1993:11], different departments with different characteristics within an organisation can affect the implementation of TQM. The fundamental reasons for failure in quality programs are the lack of clearly shared mental mode of quality throughout the organisation, and the lack of shared values and vision for the organisation [Roberts & Thomson, 1995: Online]. Although many SME's like and agree to the idea of TQM, they are not

willing to or sufficiently competent to implement it effectively [Tannock *et al.*, 2002: Online]. Leaders and managers within SME's often lack the expertise and training necessary to assimilate and apply complex models and methodology [Yeb-Yun Lin, 1999 cited by Mc Adam, 2000: Online)]. According to [Cooper, Rayson, Botchway and Mc Caffert, 2005: Online], most SME's suffer from resource constraints and management weakness. The major disadvantages of SME's are their lack of strategic thinking [Haksever, 1996: Online]. Lack of business planning, vision, and misperception of TQM practices are among the obstacle to the adoption of formal TQM programs. Furthermore, SME's as opposed to larger organisations place emphasis on short-term profitability [Zealelem & Gatachew, 2002:181-191]. According to [Zealelem and Gatachew ,2002:181-191, citing Van der Weile and Brown 1998, Walley 2000 and Ghobadian and Gallear 1996], SME's are frequently disadvantaged in terms of their financial and technical resources. Furthermore, SME's major impediment is their lack of managerial expertise, lack of strategic orientation, and the lack of necessary infrastructure to implement TQM [Zealelem & Gatachew, 2002:181-191]. According to [Mc Adam, 2000: Online, citing Gunakaran 1996], SME strategy formulation and linkage to operations is a very dynamic process. SME's find themselves in an ever-increasing market turbulence as secured niche markets are on an ongoing basis being encroached upon by large organisations. Furthermore, SME customers demand higher quality at lower cost [Ghobadian & Galler, 1996 cited by Mc Adam, 1996: Online].

## **2-9 Barriers to Total Quality Management Implementation in SME's**

According to [Quazi and Padibjo, 1998: Online, citing Hendricks 1992], unlike large organisations, SME's have limited management capabilities, and incentive resources, In addition, owner / managers, lack business experience and knowledge. The main problem faced by SME's in trying to implement TQM is a shortage of finance, limited human resources, and the time required for implementation. According to [Sebatianelli and Tamimi 2003: Online], the underlying barriers to TQM implementation is in adequate human resource development and management,

lack of planning for quality, lack of leadership for quality, inadequate resources and a lack of customer focus. According to [Farooqui, Masood and Aziz 2008:482], lack of education is also one of the reasons why TQM would fail, adding, corruption, negligence and irresponsibility as critical issues to TQM success. According to [Ismail ,2004: Online], resource limitations and resistance to change can affect the introduction of TQM within SME's, which is attributed to workers who believe that change will threaten their current positions. [Tannock *et al.*, 2002:3], list four main barriers specific to SME in terms of TQM:

- **Cultural barriers:** The culture of SME may not be conducive to TQM.
- **Management awareness barriers:** There is wide acceptance that without full management commitment, successful TQM implementation is unlikely.
- **Financial barriers:** Managers of SME's cite the cost of training and lost Production time is a major reason for not implementing TQM.
- **Training barriers:** People who do not hold any formal business qualifications operate large portion of SME's. Such owners and managers will not value formalized learning such as training so much as more highly educated people. According to [Bardoel and Sohal, 1996: Online], negative attitudes arising from experience can be a significant barrier to successful implementation of any change program. In addition, language and culture represent a major problem in communicating the principles of a TQM program, while older employees view TQM as the latest trendy fad. [Bardoel and Sohal ,1996: Online], further list ten barriers to TQM implementation, namely:
  - Perceived threat to supervisor and manager roles.
  - Disinterest at the workforce level.
  - Lack of understanding of what TQM is at the employment level.
  - Geographical dispersed sites.
  - Many casual staff.
  - Fear of job losses.
  - Inadequate training.
  - Plans not clearly defined.

- Employee scepticism.
- Resistance to data collection

[Kotelnikov, 2009: Online], list the following barriers to TQM implementation, namely:

- Lack of long term commitment and leadership for management.
- Insufficient empowerment of workers.
- Lack of cross- functional, cross-disciplinary efforts.
- Misdirected focus- emphasis on the trivial many problems facing the company rather than a critical few.
- Emphasis in internal process to the neglect of external- customer focus results
- Lack of focus in training and coaching.
- Lack of cost of quality measurements, performance reporting, and reward recognition system.
- Emphasize on solution instead of focusing on long term Improvements.



## Chapter 3

### Cement Products Production Incubator

#### Cement product incubator:

Sudan University of Science and Technology is a governance university established at 1991 as a university, before known as a big Institute of Technology in Sudan it is location at Khartoum town, it include multi collages at all sort of knowledge also it has a good participation in the society. One of this participation is this cement incubator. (Images are below).

This incubator is participation between the Sudan University of Science and Technology and the Usra Bank, and it is one of the social responsibilities of the university, the incubator aim to realize opportunity for the graduate to contribute, and good exercise to be one of the social whom push the economy and avoid the jobless which it has been bugaboo today.

The incubator established in 2009 it works as the mode of the drawn work, the budget is from the Usra Bank to the graduates by taking loan whom they formed in groups each group include 15 individuals, these groups emphases the product and manage the process of marketing so to pay back the bank loan and share the benefit.



Image 1 Veiw of the machine



Image 2 view of the machine



Image 3 view of production

### **3-1 Definition of Small and Medium Enterprises (SMEs)**

Small and medium sized enterprises (SMEs) are the engine of the European economy. They are an essential source of jobs, create entrepreneurial spirit and innovation in the EU and thus crucial for fostering competitiveness and employment. [Gunter Verheugen, Member of European Commission 2005, 3].

The new SMEs definition is User guide and model declaration. The category of small and medium size enterprises (SMEs) is made up of enterprises and which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro and/or an annual balance sheet not exceeding 43 Recommendation [2003/ 361/EC].

Defining SME is challenging, because there is no single agreed definition of an SME. And numerous are applied among OECD (Organization for Economic Cooperation and Development). Countries, and employee numbers are not the solo defining criterion .SME are usually independent non subsidizing firms which employ certain number of employees .In the European Union the most frequent upper limit designation an SME is 250 employees, but some countries can set the limit to 200, while over the sea The United States consider SMEs to include firms with fewer than 500 employees [OECD 2005, 17].

EU commission changed the definition of SME in 2005 from the previous one that was adapted in 1996. The changes were mostly done because of general economic developments since 1996, and a growing awareness to the specific barriers confronting SMEs. The new SME definition is done for all business categories and also takes better account of different types of relationships between enterprises .The new definition also ensures that different support measures are awarded only to the ones that need them. Changes are also done because the businesses are now a days more innovative and technology plays a crucial role as well. [EU Commission, 8].

**Table 2 defining SMEs**

Enterprises Category	Headcount Turnover	Balance Sheet Total
Medium –Size	< 250 employees	<_ 50 Million euro
Small	<50 employees	<_ 10 Million euro
Micro	<10 employees	<_ 2 Million euro

Source:[European Commission, 1996]

SMEs play a big role in the creation of jobs and a country's employment rate, the most evident public benefit of small business growth is the contribution made by SMEs to employment. A large number of studies carried out in various countries have concluded that small business plays major role in job creation [Hamilton, 2007, 297]. A key characteristic of an SME is flexibility, the ability to adapt to changing environment [Levy & Powell 2005, 22]. These days there is lots of pressure for firms to be flexible in developing and developed countries. Companies are facing external pressures like a transforming market and a high speed technology change.

### **3-2 Background to Business Incubators**

While business incubation is an international practice with more than 4,000 incubators used worldwide, it is an economic development mechanism that has undergone some changes since inception. This section outlines the background to business incubators (and business incubation) and indicates major shifts in the past 50 years in physical presence, legal structures and types of tenants. The following section will address shifts in services in more detail.

### **3-3 Incubator Definitions**

At the 1998 Helsinki workshop, a business incubator was defined as:- A place where newly created firms are concentrated in a limited space. Its aim is to improve the chance of growth and rate of survival of firms by providing them with a modular building with common facilities (telefax , computer facilities, etc.).

As well as with managerial support and back up services. The main emphasis is a local development and job creation. This definition dates back to 1990 and in light of

developments since then arguably places too much emphasis on physical aspects of incubator operations.

An alternative definition that highlights the other services offered by incubators is provided by the US National Business Incubation Association (NBIA).

Business incubation is a dynamic process of business enterprise development. Incubators nurture young firms, helping them to survive and grow during the start – up period when they are most vulnerable. Incubator provides hands –on management assistance, access to financing and orchestrated exposure to critical business or technical support services.

They also offer entrepreneurial firms shared office services, access to equipment, flexible leases and expandable space –all under one roof. The definition adopted by the UKBI and German ADT are similar. Whilst the provision of physical space for start –ups is again seen as a defining characteristic of incubators, equal emphasis is placed on other aspects including, in the case of the UKBI, entrepreneur training, mentoring and visibility which are not mentioned in the NBIA definition.

Business incubation is a dynamic business development process. It is a term that covers a wide variety of processes, which help to reduce the failure rate of early stage companies and speed the growth of companies which have the potential to become substantial generators of employment and wealth.

A business incubator is usually a property with small work units that provide an instructive and supportive environment to entrepreneurs at start –up and during the early stages of business.

Incubators provide three main ingredients for growing successful business –an entrepreneurial and learning environment, ready access to mentors and investor, visibility in the marketplace.

The definitions of incubation proposed by researcher over the period 1985-2001 are included in table 3.

**Table 3 definitions of incubation**

Authors(s)	Definitions
Allen(1985)	Business incubators are facilities that promote the early stage growth of companies by providing rental spaces shared office services, and business consulting services.
NBIA(1985)	A business incubator is an economic development tool designed to accelerate the growth and success of entrepreneurial companies through an array of business support resources and services, developed or orchestrated by incubator management and offered both in the incubator and through its network of contacts.
Smilor and Gill,Jr(1986)	A technology –incubation program is an innovative system designed to assist entrepreneurs in the development of new technology –based firms, both start –ups and fledglings. It seeks to effectively link talent, technology, capital and know –how to leverage entrepreneurial talent in order to accelerate the development of new companies, and thus speed the commercialization of technology.
Allen and McCluskey(1990)	A business incubator is a facility that provides affordable space, shared office service, and business development assistance in an environment conducive to new venture creation, survival, and early –stage growth.
Sherman and Chappell(1998)	Business incubator programs are defined as those that were current members of the NBIA and had been in operation for a period of at least 5 years. In addition, these programs had management on –site; provided management guidance, technical assistance, rental space, and consulting services to their clients; shared basic business services and equipment; and had a stated graduation policy.
Hanssen,et al,(June 2000)	Incubator is defined as, "any organization that helps start-ups develop in an accelerated fashion by providing them with a bundle of services, such as physical space, capital, coaching, common services, and networking connection".
Manan and Yunos (2001)	Business incubator is an organization that systemizes the process of creating successful new enterprises by providing them with a comprehensive and integrated range of services.
Neal Young (2001)	Incubators are intended to provide new firms with the supportive network necessary to increase their probability of survival during the crucial early years when they are most vulnerable.
U.S. Small Business Administration	Incubators are defined as physical facilities that provide new firms with the supportive network necessary to increase their probability of survival during the crucial early years when they are most vulnerable.

### **3-4 Earliest incubators**

Business incubation is usually dated from 1956, the year in which Massey-Ferguson, the biggest industry in the town of Batavia, New York, closed down. A large complex of multistory buildings was left abandoned and unemployment was estimated to have climbed to more than 20 per cent (While Manusco's incubator is considered to be the first in the world, adoption of the model was slow. [Knopp 2012] notes that by 1980, there were only 12 incubators in the United States and it wasn't until the period of 1984-87 that the work by the US Small Business Administration to build the incubator movement prompted further growth. This work included regional conferences to promote the incubator concept, newsletters and books on incubation and the formation of the NBIA [Wiggins & Gibson, 2003]. Other significant moments in the early development of business incubation within the US and elsewhere include:

- The creation of the National Science Foundation's Innovation Centres, which included incubation as part of programs. The centres were developed and supported by the foundation as early as 1973 [Bhabra-Remedios & Cornelius, 2003]
- The 1982 enactment in Pennsylvania of the state's Ben Franklin Partnership Program which advanced a comprehensive technology and manufacturing agenda, including incubators as a key component [NBIA, 2012].
- The use of this program as a model for other US state support for business incubation [NBIA, 2012].
- The adoption of incubator models in the UK and Europe in the 1980s [CSES, 2002].
- The development of China's incubation program, which grew from the catalyst of United Nations Development Program in 1987 to have 127 incubators by 2002 [CSES, 2002].
- The creation of Australia's first incubation programs in the mid to late 1980s [AusIndustry, 2003, NBIA, 2012]. At the time, the Manusco Family, headed by Joe Manusco, a hardware store manager purchased the complex and first sought to find a single company to rent the plant. According to [NBIA ,2012], after a month this idea

was abandoned and instead, Manusco divided the building and rented it to separate businesses “that he would nurture by providing shared office services, assistance with raising capital and business advice” [NBIA, 2012]. The Batavia Industrial Centre he created remains in operation and recently celebrated its 50th anniversary, with the claim of being the world’s oldest incubator [Anselmo, 2009].

### **3-5 Incubator Contribution**

Business incubators provide a complete set of services and a suitable environment to support entrepreneurial skills and to help entrepreneurs in developing their ideas, skills, and knowledge. So, it is important to identify the relationship between business incubators and entrepreneurship in the right way and make the related concepts clear to all interested parties. Entrepreneurs need a place where they can obtain operational services at a low cost to reduce start-up and growth costs. Entrepreneurs also need to reduce the risk of failures. They also want to access world class services and build on proven models. Demands for and access to reliable high-speed Internet are also critical in areas of incubation services. The lack of high speed Internet outside of a region can be a stumbling block in growing entrepreneurs. Communities prioritize an incubator as an asset to support entrepreneurs. [Elaydi et al, 2009, P16], [Peters et al 2004] mentioned what Baron and Shane (2003) explained that the entrepreneurial process unfolds over time and moves through a number of different phases. These phases are namely:

- (1) The idea for new product or service and/or opportunity recognition.
- (2) Initial decision to proceed.
- (3) Assembling the required resources (information, finance, and people).
- (4) Actual launch of the new venture.
- (5) Building a successful business and finally harvesting the rewards.

Events are viewed as outcomes during each phase that are affected by individual-level factors (skills, motives, characteristics of entrepreneurs), group-level (ideas, inputs from others, effectiveness in interactions with venture capitalists, customers, potential employees) and societal-level factors (government policies, economic



conditions, technology, etc.). It can be seen from the above explanation, that once the idea is formed/recognized and the entrepreneur decides to proceed with that idea, incubators could play a significant role from the point of assembling the resources to harvesting the rewards. The role of the incubator in the entrepreneurial process has changed from being just a business center with office facilities to one offering training, networking and consulting in all areas of expertise to startup firms. This implies that being tied to a broad based loosely connected network is of great importance to entrepreneurs. In social network terms brokers are actors who facilitate links between persons who are not directly connected. We propose that incubators can also be viewed as brokers. This resonates with the idea that a huge part of the value of the incubator is its role as an intermediary to a much larger set of networks. We surmise that, how incubator programs and managers deal with this conflict is a factor in incubator success. Further, we propose that the types of ties and networks will be important. There are good and bad networks for entrepreneurial success.

### **3-6 Types of Incubators**

Just as there are many types of businesses, there are many different types of incubators; and not all incubators are created equal. The sections below, describe incubators classified according to the following types:-

1-Based on physical space.

2-Based on management support provided vs. technology level.

3-Based on the objectives of their primary sponsors.

#### **3-6-1 Incubators Based on Physical Space**

Based on the physical space provided, incubators are classified as: " traditional or first generation " and "virtual or second generation". The "first generation" incubators (from the period between the 1970s to the mid 1990s) are also called "traditional" incubators. They facilitate economic development by promoting entrepreneurship, innovation, employment opportunities and growth [Malan, 2002]. These types of incubators are generally operated directly by national or local authorities. Universities or private sector organizations have established specialized incubators. Typically, this

model provides affordable multi-tenant space, shared services, and full range of business consulting services. The "second generation" incubators (from the late 1990s) referred to by [Lalkaka, 2001] are often primary virtual. These "second generation" incubators are also called "new economy incubator" or "incubators without walls". These incubators often have an essentially virtual presence, with financial and business services at the core of the offering. These incubators tend to focus mainly on high technology and internet related activities, and do not have job creation as their principal aim. Instead these are private sector, profit –driven incubators with payback coming from investments in companies rather than rental income. These types of incubators typically provide work space and focused consulting services to a small growth-potential group of firms. Further, they take equity in these companies and accelerate them to the market through technology licensing \ acquisitions deals, or via Initial Public Offering (IPOs). Given their focus on technology and Internet related activities, in the 1999-2000 period, some 400 for –profit, internet incubators were added in the U.S. and elsewhere because of the expanding opportunities that the Internet seemed to offer [Lalkaka, 2001]. However, with the sharp decline of dot . com companies since mid -2000, the bulk of these incubators have closed down and not developed to the extent originally hoped [Lalkaka, 2001]. The differences lie in the varying emphasis placed on the importance of physical aspects, as opposed to other business support services, and the business incubation process itself.

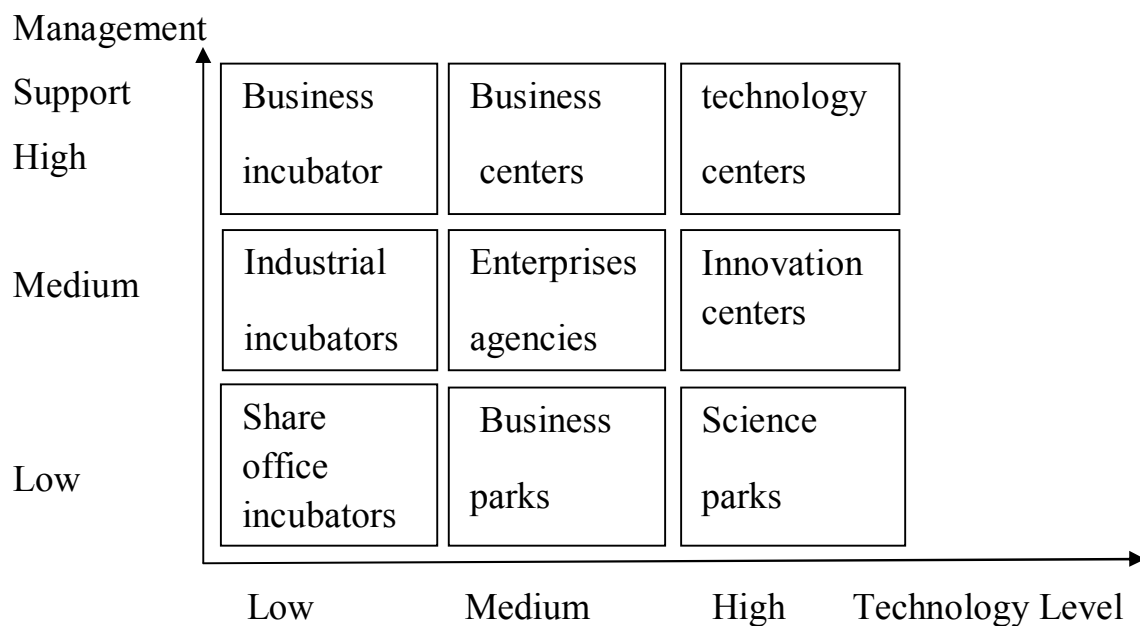
### **3-6-2 Incubators Based on Management Support Provided vs. Technology**

The two dimensions of management support and technology level gives rise to nine different types of incubators, these are:-

- Shared office incubators.
- Enterprise agencies.
- Innovation centers.
- Business incubators.

- Business centers.
- Technology centers.
- Business parks.
- Science parks.
- Industrial incubators.

The compensation of incubator units (space) and business support services is what makes the incubator concept unique. Further, the importance of physical space as opposed to other business support services constitutes the essence of the concept. The relationship between incubator modalities and between these and other SME promotion structures that include a physical space element is illustrated below in figure 3.



**Figure 3:Types of incubators Based on management support vs. technology level**

Source: [Malan, 2002].

Shared office incubators, in the bottom left-hand corner of figure 3, generally have a non-selective intake, provide little or no management support and have no special criteria with regards to business activities and technology content. Whereas, on the other hand technology centers, in the upper right –hand corner, have highly selective admission criteria, provide hands on management support, and have highly specialized technology focus.

### 3-6-3 Incubators Based on the Objectives of Primary Sponsors

Incubators can be broadly classified into four different types, depending on the primary sponsors and the objectives of each type. [Allen and McCluskey 1990], used a value added continuum, with property development and business development at the two extremes to describe four kinds of incubators and their operations. The four types represent a slightly different focus for incubator development and operation. For profit property development incubators seek primarily to capture real estate appreciation [Nyrop, 1986]. Non –profit development corporations [Allen, 1985; Pacholski, 1988; Smilor, 1987] primarily focus on creating jobs and enhancing the entrepreneurial climate. Academic incubators seek to commercialize university technology [Allen, 1985; Smilor, 1987] while at the same providing local economic development benefits. Beyond these primary organizational objectives secondary objectives are also highlighted (see table 4).

**Table 4: The Business Incubator Continuum Facility Objectives**

	Real Estate For Profit Property Development Incubators	Value added Non –Profit Corporation Incubators	Through Academic Incubators	Business Development For-Profit Capital Incubators
Primary Objective	Real Estate Appreciation  *Sell Propriety Services to tenant	Job Creation  *Positive statement of entrepreneurial potential	Faculty –industry collaboration *Commercialize University research	Capitalize Investment opportunity *rapid enterprise growth
Secondary objective	*Create opportunity for technology transfer *Create investment opportunity	*Generate sustainable income for organization  *Diversity economic base.  *Bolster tax base. *Complement existing programs *utilize vacant facilities.	*Strengthen service and instructional mission. *Capitalize investment opportunity *Create good will between institution and community	*Product development  *Self sufficiency  *Wealth creation.

Source: [Allen and McCluskey, 1990]

Beyond these four organizational types, two other types are worth mentioning. The first - Public - Private partnership - is a hybrid combination of two or more of the previously mentioned four organizational types. In these types of incubators, the partnership objectives are very diverse [Allen and McCluskey, 1990].

The last type of organizational arrangement is just starting to appear as a distinct group. A few large companies have developed corporate incubators to develop entrepreneurial spirit among employees. The focus of the present research is on the following type of incubators: for profit property development corporation, academic, and for profit capital incubators.

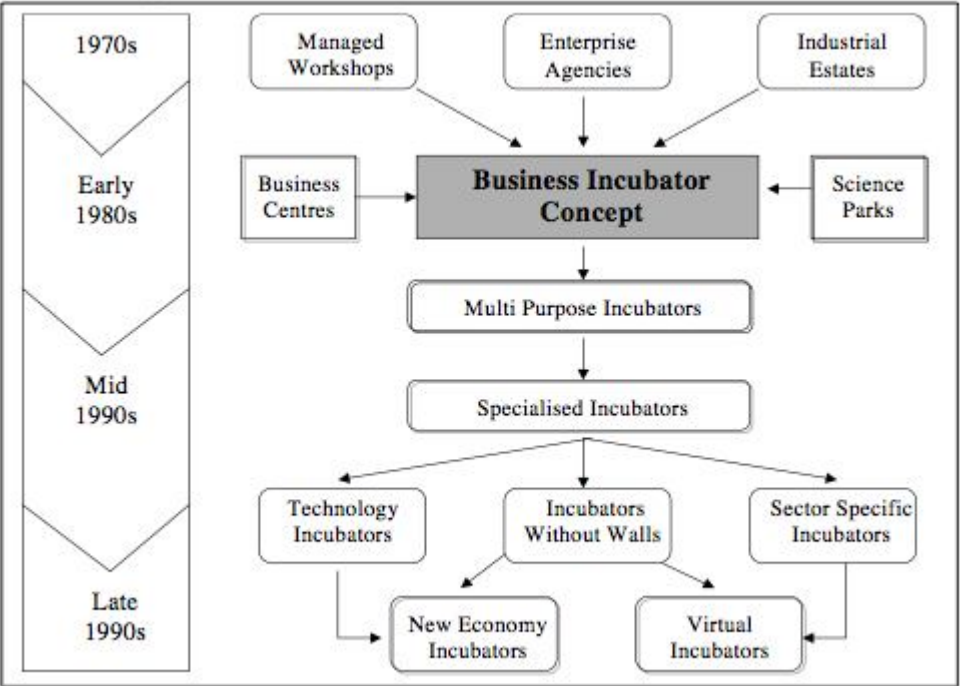
### **3-7 Physical Structure of Incubators**

Early incubators were geographically rooted and physically imposing, with the earliest incubators created in large former factories and plants, which is to be expected considering the motivation of many early incubator operators were to fill pre-existing real estate that would otherwise be left vacant. As the sector developed, however, the physical structures of incubators changed, reflecting the fact many were developed in purpose-built facilities rather than repurposed properties [C Campbell & Allen, 1987; CSES, 2002]. With the development of the internet and greater opportunity for businesses to connect online or through email and other communication tools, came the rise of the virtual incubator, or incubators without walls, as they were sometimes called [Bollingtoft & Uihøi, 2005; Nowak & Grantham, 2000].

The rise of sector-specific incubators also changed the physical requirements of incubation in many cases. As an example, incubators that assist manufacturing businesses tend to require a greater floor space than those assisting service-based firms, and need specialised equipment or facilities such as fabrication and industrial space rather than office space. A retail incubator may need shop fronts and warehousing room while a food incubator will need commercial kitchen facilities [Lewis, Harper-Anderson, & Molnar, 2011].

Studies that have sought to benchmark physical and other characteristics of European incubators have established that ‘typical’ incubators in the EU have approximately 5,800 square metres of space for tenants, sufficient to accommodate about 18 firms at any one time [CSES, 2002]. The NBIA’s *2002 State of the Business Incubation Industry* survey found incubator sizes in the US ranged from 500 square feet (a mere 46 square metres) to 770,000 square feet or 71,535 square metres). The average US incubator was approximately 4,300 square metres and the median size approximately 2,300 [Boyd, 2006].

The Centre for Strategy and Evaluation Services [CSES, 2002] report to benchmark European business incubators argued the term ‘incubator’ is now used to encapsulate a broad swathe of facilities (virtual and physical) that embrace the idea of enterprise support. The following figure illustrates the relationship the CSES sees between different forms of incubators and their development over time.



**Figure 4 Evolution of the business incubator model [CSES, 2002]**

# **Chapter 4**

## **Methodology**

### **4-1 Introduction**

This chapter aim to survey contained therein is to determine what the key factors that contributes to a lack of total quality management implementation in incubators. The ultimate objective being to solve the statement of research problem as defined in chapter 1 sub-section 1-5 and which reads" the lack of successful implementation of TQM in the incubators in Sudan is culminating in a degradation of the quality of the industry" as defined in chapter 2 sub-section 2-8.

This chapter describes the steps taken to conduct the proposed study. This chapter is comprised of eight sub-sections. The first sub-section describes the chapter. The second sub-section describes the research designs of the proposed study. The third sub-section discusses the sampling details. The fourth sub-section looks at the survey instrument details and the fifth sub-section explains the measures used. The sixth sub-section describes the questionnaire design. The seventh sub-sections discuss the questionnaire pretest. The last sub-section explains proposed data analysis.

### **4-2 Research Design**

The proposed study involved an investigation of TQM affecting the performance of business incubators. Little research had been done in literature to understand the principle of TQM and who to implement this research is formal in nature, as a number of hypotheses, research questions, and objectives were empirically tested. A structured questionnaire format was chosen over the mailed survey for the following reasons:-

- 1-It provided a consistent means of collection data.
- 2-It could be administrated in a neutral environment, thereby encouraging candid responses.
- 3-It helped in reducing any bias that may have been introduced in data collection through open- end interviews.

4-It permitted more detailed quantitative statistical analysis than semi-structured or open-end interviews allow. The proposed study was carried out once and represents a snapshot at one point in time.

### **4-3 Data Collection**

The relevant data for the research are going to be collected from both secondary and primary sources. The first type is secondary data, which is characterized by the fact that someone else has collected it and published it for a different purpose. The second type of information is collected by the user for specific purpose and is called primary data. Simple random sampling used to collect the required information through structured questionnaire by using five point likert scales. Descriptive analysis and chi-square was used in this research to analyze the data. Questionnaires will serve as the data collection methodology, as it falls within the broader definition of "survey research" or "descriptive survey" [Remeny et al (2002:290)], defines the concept of survey as "the collection of a large quantity of evidence usually numeric, or evidence that will be a questionnaire". A questionnaire consists of a list of questions compiled in order to elicit reliable responses from a chosen sample with the aim to determine what the participants do, think or feel. There are two approaches in structuring questions namely, positivistic (structured closed questions), and phenomenological (unstructured open-ended) owners, managers, and line supervisors.

### **4-4 Data Validity and Reliability**

The validity is the most important demand on a measuring instrument as it shows the instruments ability to measure what it is intend to measure. In this case the instrument is the interview guide. Concerning qualitative interviews the objective is to get at what the respondent mean or how he or she apprehends the situation. In order to increase the validity, the interviews had an open character with a scope for discussion [Eriksson & Wiedersheim- Paul, 1999:38ff.Trost:101] According to [Collis and Hussey, 2003:186],"Validity" is concerned with the extent to which the



research findings accurately represents what is happening. More specific, whether the data is a true picture of what is being studied. According to [Cooper and Schindler, 2006:318-320], three major forms of validity can be identified namely "construct validity".

Reliability refers to how authentic and solid the result in the research is independently of the author. That the survey can be conducted again, by anyone else and by the same approach, and still show similar results. Though there are some scopes for different outcome, as the research is based on a qualitative method where the interpretation might alter depending on who the investigator is. Reliability (also referred to as "trust worthiness", is concerned with the findings of the research "[Collis & Hussey, 2003:186]". The findings can be said to be reliable if you or anyone else repeated the research and obtained the same results. [Cooper and Schindler, 2006:318-320], define the content validity of a measuring instrument as the extent to which it provides adequate coverage of the investigative (sub-) questions guiding the study. Criterion –related validity according to [Cooper & Schindler, 2006:318-320], reflects the success of the measures used for prediction or estimation constructive validity according to [Collis & Hussey, 2003:59], and refers to the problem that there are number of phenomena, which are not directly observable. In this respect, [Collis & Hussey, 2003:59], cite satisfaction, motivation, ambition and anxiety as examples

## **4-5 Samples**

The sample used for this research consisted of incubator administrators, involved in the day-to-day operations of the incubator. The sample was so proposed, as the respondents would have the necessary insights and experiences of managing incubators.

### **•The target population:**

With any survey, it is necessary to clearly define the target population, which [Collis & Hussey, 2003:157]. Define as follows: "population is any precisely defined

set of people or collection of items which is under consideration". The "sample frame" define by[Vogt 1993, and cited by Collis and Hussey 2003,155-160], as "a list or record of the population from which all the sampling units are drawn". Four incubators participated in the survey, the reasons behind choosing this group are:-

- 1- Has a same hierarchy levels.
- 2-They are more related to the quality system of the company.
- 3-They carry out the executive work of the company.
- 4-They have a good background about quality.
- 5-The sample drawn should be a convenient sample.

#### **4-6 Measurement Scale**

The survey will be based on the Likert scale, whereby respondents were asked to respond to questions or statement [Parasuaman 1991:410]. The reason for choosing the Likert scale, is the fact that the scale can be used in both respondent –centered (how responses differ between people) and stimulus- centered (how responses differ between various stimuli) studies, most appropriate to glean data in support of the research problem in question [Emory and Cooper 1995:180-181]. The advantages in using the popular Likert scale according to [Emory and Cooper 1995:180-181] are:-

- 1-Easy and quick to construct.
- 2-Each item meets an empirical test for discriminating ability.
- 3-The Likert scale is probably more reliable than the Thurston scale.
- 4-The Likert scale is also treated as an interval scale.

The researcher used statistical package for social science SPSS to facilitate meaningful statistics when calculating means, standard deviation, and Pearson correlation coefficients, to emphasis the hypothesis.

#### **4-7 Questionnaire Design**

The questionnaire was developed based on the literature review. A consolidated questionnaire composed of different measurement scales and questions was designed. Each related to the principles of TQM which is measured on 1-4 Likert scale. The Likert scale was incorporated in the questionnaire as the respondents were asked to

rate the importance of the factors relative to another factor, the objective of the research was to establish those factors that have a relatively higher score. The questionnaire consisted of four sections. The first section captured first hypothesis phrases (1-15), the next section asked second hypothesis phrases (16-23), section three was related to third hypothesis phrases(23-29), section four for the last hypothesis phrases (30-44).

Number of distributed questionnaires is = 60

Number of received is = 48

Number of questionnaire forms analyzed is =48

The SPSS program (statistical package for social science) was used for the analysis of data collected.

Chi- square test adopted to test the hypothesis of study at  $\alpha = 0.05$  a P-value (Probability value) that measure statistical significance which automatically incorporate the chi-square values. Results will be regarded as significant if the p-values are smaller than 0.05, because this value presents an acceptable level on a 95% confidence interval ( $p \leq 0.05$ ). The p-value is the probability of observing a sample value as extreme as, or more extreme than, the value actually observed, given that the null hypothesis is true. This area represents the probability of a Type 1 error that must be assumed if the null hypothesis is rejected (Cooper & Schindler, 2006:509).

#### **4-8 Pretest Questionnaires**

The questionnaire had been pretested by the supervisor and two other professional statisticians chosen by the supervisor to emphasise the reliability of the questionnaire.

#### **4-9 Data Analysis**

As the objective of this research is to find the factors that affect the performance of business incubators, correlation analysis helped in explaining the independent variable or not. And was performed with the help of a statistical package for social science SPSS.

# **Chapter 5**

## **Data Analyses and Interpretations of Result**

### **5-1 Introduction**

This chapter discusses the results of the data analysis of the survey conducted in the cement production incubator and other incubators of the Sudan University of Science and technology. Which it is employee between 20 and 100? The main aim of this survey is to determine the actions required for Total Quality Management to be successfully implemented within the incubators. The data obtained from the completed questionnaires will be presented and analysed by means of various analyses (uni-variate, bi-variate and multivariate) as it comes applicable.

The data has been analyzed by using statistical package for social science SPSS. As descriptive statistics, frequency tables will be displayed when required, which shows the distributions of the statement responses. Descriptive statistics is used to summarize the data. As a measure of central tendency and dispersion, also should show the means and standard deviation of all the statements.

### **5.2 Analysis Method**

#### **5.2.1 Validation Survey Results**

A descriptive analysis of the survey results returned by the research questionnaire respondents should be reflected in this section. The responses to the questions obtained through the questionnaires are indicated in table format for ease of reference. A database was developed in order to test for responses that were out of the set boundaries. The database in which the data was captured was developed so that data validation was insured. There are build-in boundaries and rules so that any mistakes made by the data capture could be detected. Other measures to ensure data validity was to capture the information twice and then compare to see whether any mistakes were made and correct them. Data validation is the process of ensuring that a program operates on clean, correct and useful data. The construct validation however can only be taken to the point where the questionnaire measures what it is

supposed to measure. Construct validation should be addressed in the planning phases of the survey and when the questionnaire is developed. This questionnaire is supposed to measure the constraints to Total Quality Management implementation within the incubator in terms of accreditation.

### **5.2.2 Data format**

The data in its original questionnaire format has been coded according to a predetermined coding scheme and captured on a database in SPSS, which was developed for this purpose. It was then imported into SPSS format through the module. This information was then analysed.

### **5.2.3 Technical Report with Graphical Displays**

A written report with explanations of all variables and their outcomes were compiled. A cross analysis of variables where necessary was performed, attaching statistical probabilities to indicate the magnitude of differences or associations. All inferential statistics should be discussed in separate paragraphs.

### **5.2.4 Assistance to Researcher**

The conclusions which are made by the researcher should be validated by the statistical report. Help is given to interpret the outcome of the data. The final report which should be written by the researcher was validated and checked by a qualified statistician to exclude any misleading interpretations.

## **5.3 Analysis**

In total, the questionnaire should be posted to four incubators. The questionnaire will be tested for reliability.

### **5.3.1 Reliability Testing**

Statistical package SPSS is an index of reliability associated with the variation accounted for by the true score of the “underlying construct”. Construct is the hypothetical variables that are being measured (Cooper & Schindler, 2006:216-217). More specific, SPSS measures how well a set of items (or variables) measures a single uni-dimensional latent construct.

The reliability test should be done on all the items (statements), which represent the measuring instrument of this survey, with respect to the responses rendered in this questionnaire.

### 5.3.2 Descriptive Statistics

The descriptive statistic for all the variables in the questionnaire measuring, are incubators description and the employee's responses to the questionnaire with respect to quality with the frequencies in each category and the percentage out of total number of questionnaires. It is important to note that statistic is based on the total sample. In some cases there are no answers given (left blank) in the questionnaire. These descriptive statistics are also shown in the Appendix.

• **Analyses of the situation of status:**

**Table (5) Situation of Status Statistics**

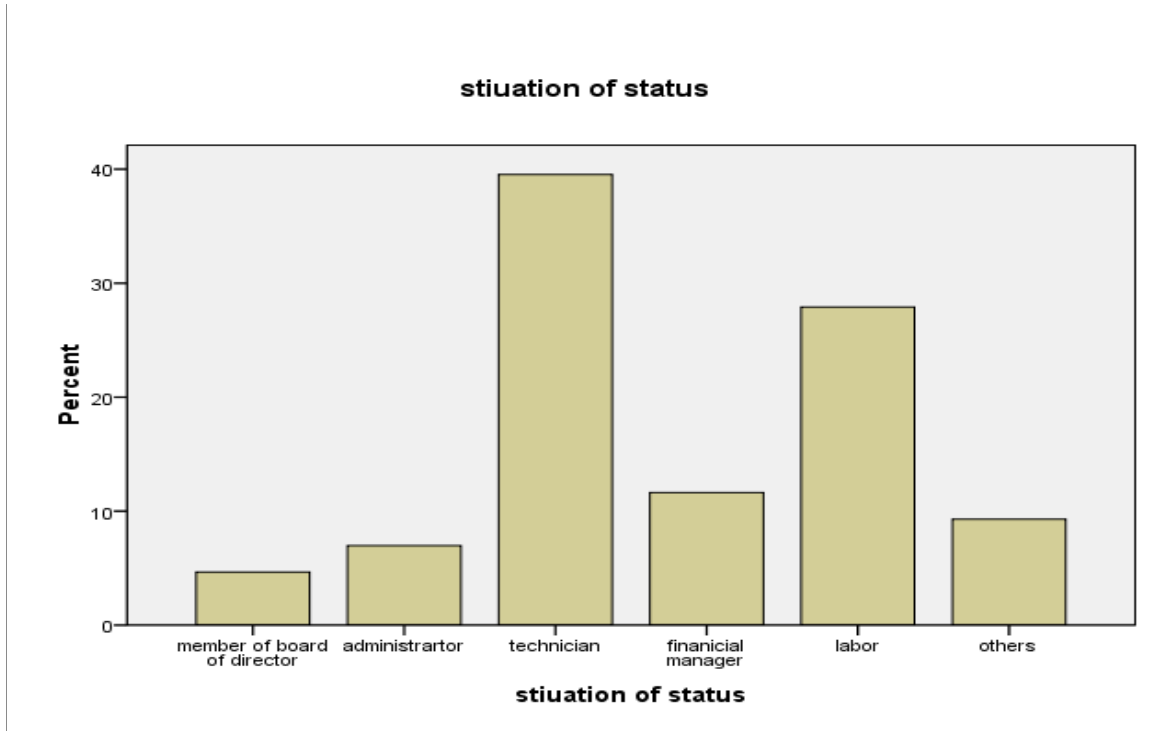
N	Valid	43
	Missing	5
	Mean	3.7907
	Mode	3.00
	Std. Deviation	1.31942
	Variance	1.741

The type of study sample where we observed that there are 43 individuals are respondents and 5 individuals of the sample are not respondents, the Mean is 3.7907, the Mode is 3.00 and the Standard Deviation is 1.31942

**Table (6) Situation of Status Frequency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	member of board of directors	2	4.2	4.7	4.7
	administrator	3	6.2	7.0	11.6
	technician	17	35.4	39.5	51.2
	financial manager	5	10.4	11.6	62.8
	labor	12	25.0	27.9	90.7
	others	4	8.3	9.3	100.0
	Total		43	89.6	100.0
Missing	System	5	10.4		
Total		48	100.0		

Table (6) and figure (5) observed that the technicians are 17 individuals of the respondent given a percentage 35.4% , labors are 12 individuals of the respondent given a percentage 25%, financial managers are 5 individuals of the respondent given a percentage 10.4%, 4 individuals of the respondent others given a percentage 8.3%, 3 individuals of the respondent administrators given a percentage 6.2%, 2 individuals of the respondent are member of board of director, this evidenced that the incubators relies on it work on technicians and spectrum due to the nature of work.



**Figure 5 Situation of Status**

**•Analyses of the age:**

**Table (7) Age Statistics**

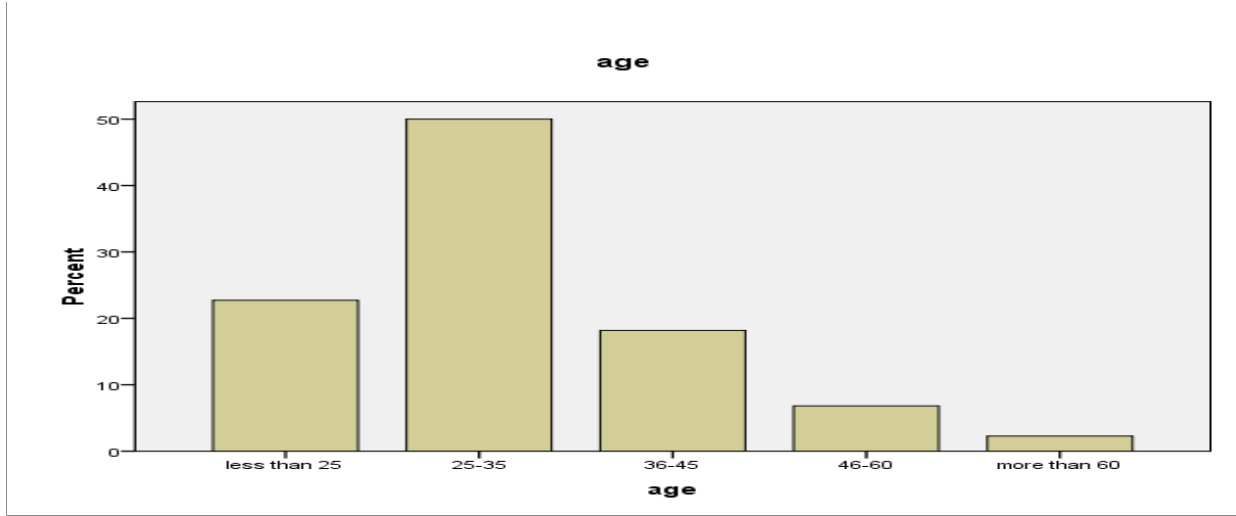
N	Valid	44
	Missing	4
	Mean	2.1591
	Mode	2.00
	Std. Deviation	.93866
	Variance	.881

The type of study sample where observe at table 7 that there are 44 individuals is respondents and 4 of the sample is not respondents, the Mean is 2.1591, the Mode is 2.00 and the Standard Deviation is 0.93866.

**Table (8) Age Frequency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 25	10	20.8	22.7	22.7
	25-35	22	45.8	50.0	72.7
	36-45	8	16.7	18.2	90.9
	46-60	3	6.2	6.8	97.7
	more than 60	1	2.1	2.3	100
	Total	44	91.7	100.0	
Missing	System	4	8.3		
Total		48	100.0		

Table (8) figure (6) shows the distribution of age group of the study sample, where we observed that 22 individuals of the sample their ages between 25-35 years given a percentage of 45.8%, 10 individuals their age less than 25 years given a percentage 20.8%, 8 individuals of the sample their age between 36-45 given a percentage 16.7%, this indicating that the incubators depends on young people mostly to run its work.



**Figure 6 Age**



• **Qualification Analyses**

**Table (9) Qualification Statistics**

N	Valid	35
	Missing	13
	Mean	2.1714
	Mode	1.00
	Std. Deviation	1.63574
	Variance	2.676

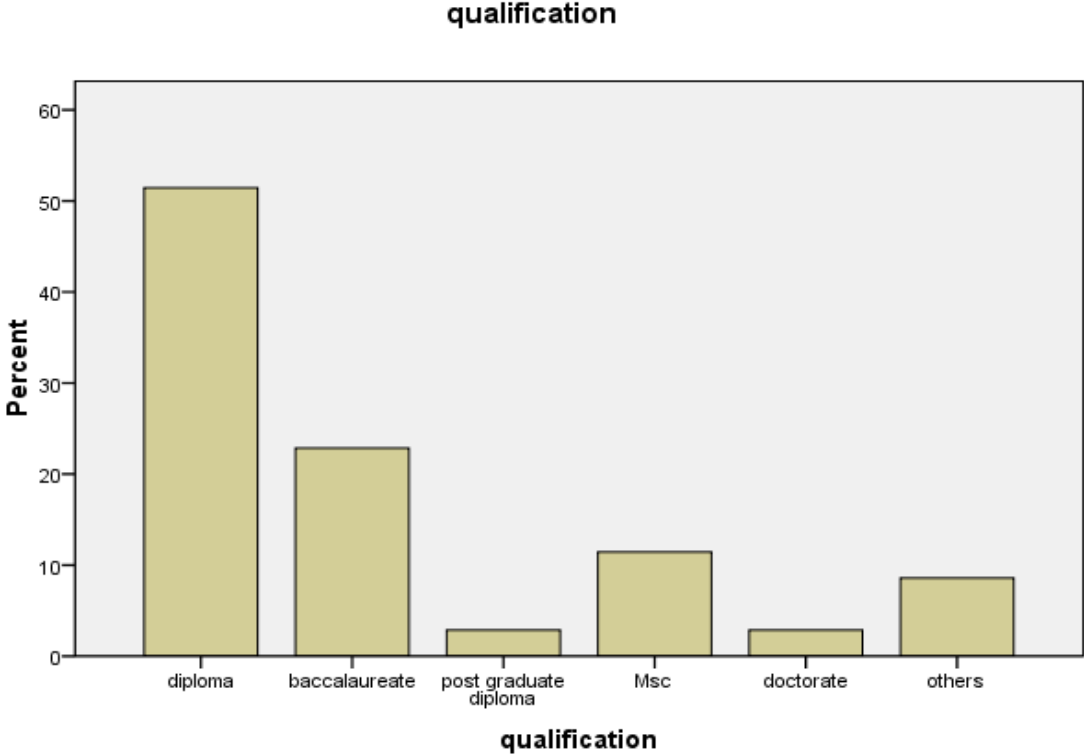
The type of study sample where we observe in figure 9 that there are 35 individual is respondents and 13 of the sample is not respondents, the Mean is 2.1714, the Mode is 1.00 and the Standard Deviation is 1.63574.

**Table (10).Qualification Frequency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	diploma	18	37.5	51.4	51.4
	Bsc	8	16.7	22.9	74.3
	post graduate diploma	1	2.1	2.9	77.1
	Msc	4	8.3	11.4	88.6
	Phd	1	2.1	2.9	91.4
	others	3	6.2	8.6	100.0
	Total	35	72.9	100.0	
Missing	System	13	27.1		
Total		48	100.0		

Table (10) figure (7) shows the distribution of the qualification of the study sample, where observed that 18 individuals of the sample have a diploma given a

percentage 37.5%, 8 individuals have a Bsc given a percentage 16.7% , 4 individuals of the sample have Msc certificate given a percentage 8.3% , this indicating that the incubators depends on technician mostly to run its work.



**Figure7 Qualification**

**•Analyses of the vocational colleagueship**

**Table 11 Vocational Colleagueship Statistics**

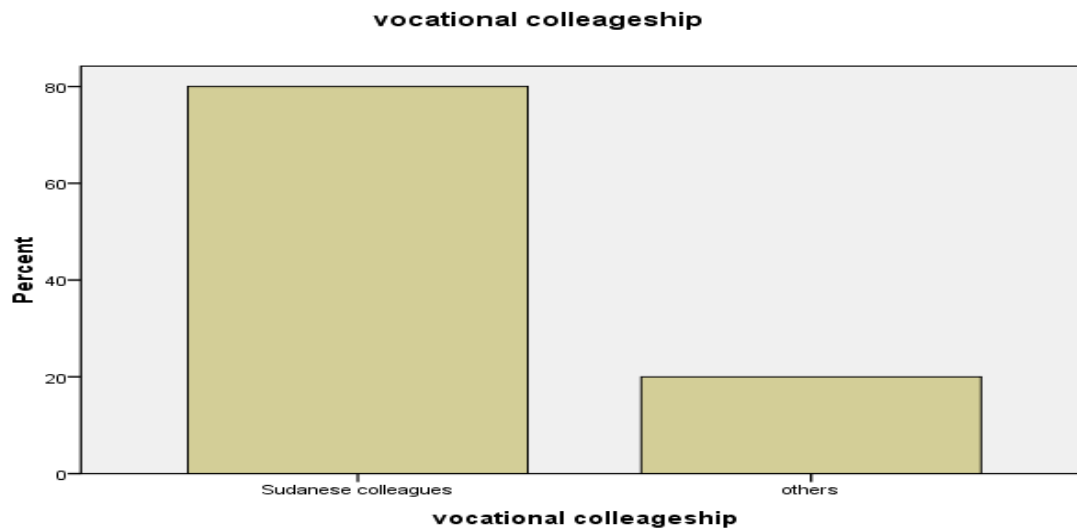
N	Valid	15
	Missing	33
	Mean	1.8000
	Mode	1.00
	Std. Deviation	1.65616
	Variance	2.743

The type of study sample where observe at table 11 that there are 15 individual is respondents and 33 of the sample is not respondents, the Mean is 1.8000, the Mode is 1.00 and the Standard Deviation is 1.65616

**Table 12 Vocational Collegueship Frequency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sudanese colleagues	12	25.0	80.0	80.0
	others	3	6.2	20.0	100.0
	Total	15	31.2	100.0	
Missing	System	33	68.8		
	Total	48	100.0		

Table (12) figure (8) shows the distribution of the qualification of the study sample, where we observed that 12 individuals of the sample have a Sudanese colleagues given a percentage of 25%, 3 individuals have others colleagueship given a percentage 6.2 %, this indicating that the incubators is not interesting to have vocational colleagueship



**Figure 8 Vocational colleagueship**

•Analyses of the scientific specialization:

**Table 13 Scientific Specialization Statistics**

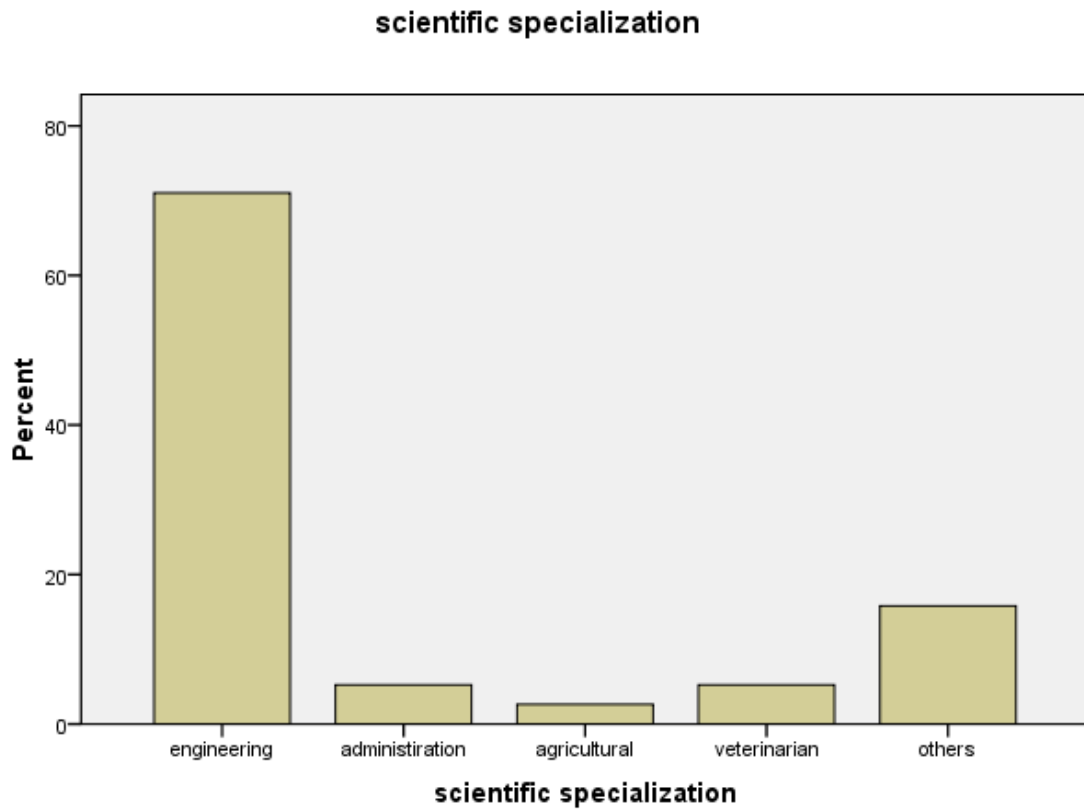
N	Valid	38
	Missing	10
	Mean	1.8947
	Mode	1.00
	Std. Deviation	1.55597
	Variance	2.421

Table (13) shows the type of study sample where we observe that there are 38 individuals is respondents and 10 of the sample is not respondents, the Mean is 1.8947, the Mode is 1.00 and the Standard Deviation is 1.55597.

**Table 14 Scientific Specialization Frequency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	engineering	27	56.2	71.1	71.1
	administration	2	4.2	5.3	76.3
	agricultural	1	2.1	2.6	78.9
	veterinarian	2	4.2	5.3	84.2
	others	6	12.5	15.8	100.0
	Total	38	79.2	100.0	
Missing	System	10	20.8		
Total		48	100.0		

Table (14) figure (9) shows the distribution of scientific specialization of the study sample, where we observed that 27 individuals of the sample engineering given a percentage of 56.2%, 6 individuals others given a percentage 12.5% , 2 individuals of the sample are administration and veterinarian given a percentage 4.2% , this indicating that the incubators depends on engineering mostly to run its work.



**Figure 9 Scientific Specialization**

**• Analyses of the experience:**

**Table 15 Experience Statistics**

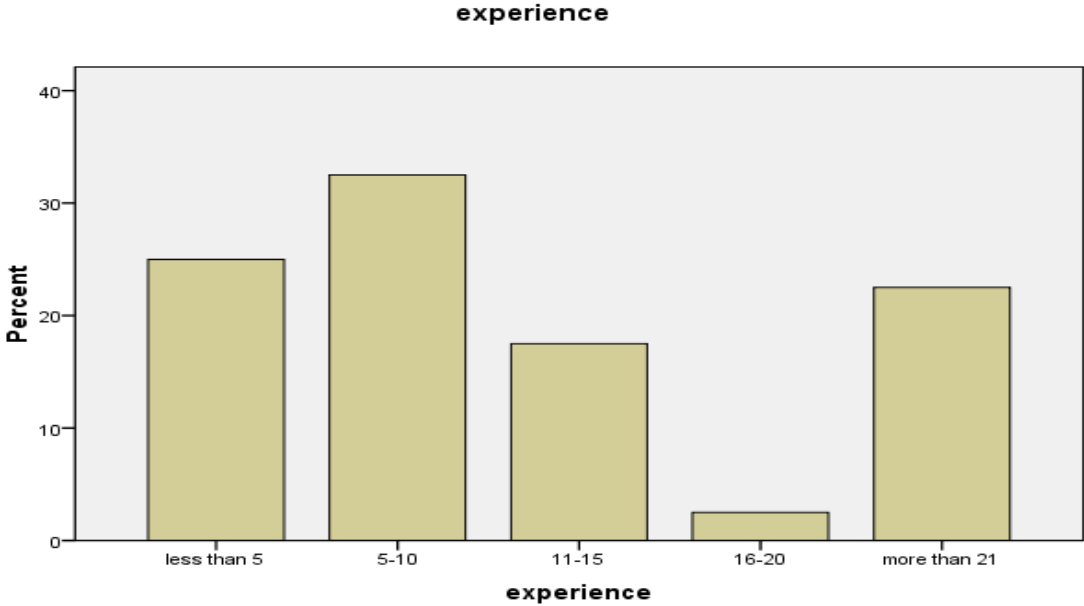
N	Valid	40
	Missing	8
	Mean	2.6500
	Mode	2.00
	Std. Deviation	1.47718
	Variance	2.182

Table (15) the type of study sample where we observe that there are 40 individuals is respondents and 8 of the sample is not respondents, the Mean is 2.6500, the Mode is 2.00 and the Standard Deviation is 1.47718.

**Table 16 Experience Frequency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 5	10	20.8	25.0	25.0
	5-10	13	27.1	32.5	57.5
	11-15	7	14.6	17.5	75.0
	16-20	1	2.1	2.5	77.5
	more than 21	9	18.8	22.5	100.0
	Total	40	83.3	100.0	
Missing	System	8	16.7		
Total		48	100.0		

Table (16) figure (10) shows the distribution of experience of the study sample , where we observed that 13 individuals of the sample are between 5-10 years given a percentage of 27.1%, 10 individuals less than 5 years given a percentage 20.8% , 9 individuals of the sample between more than 21 years and given a percentage 18.8%, 7 individuals of the sample between 11-15 years given a percentage 14.7% , this indicating that the incubators depends on labors experience between 5-10 years to run its work.



**Figure 10 Experience**

•Analyses of the Career:

**Table 17 Career Type Statistics**

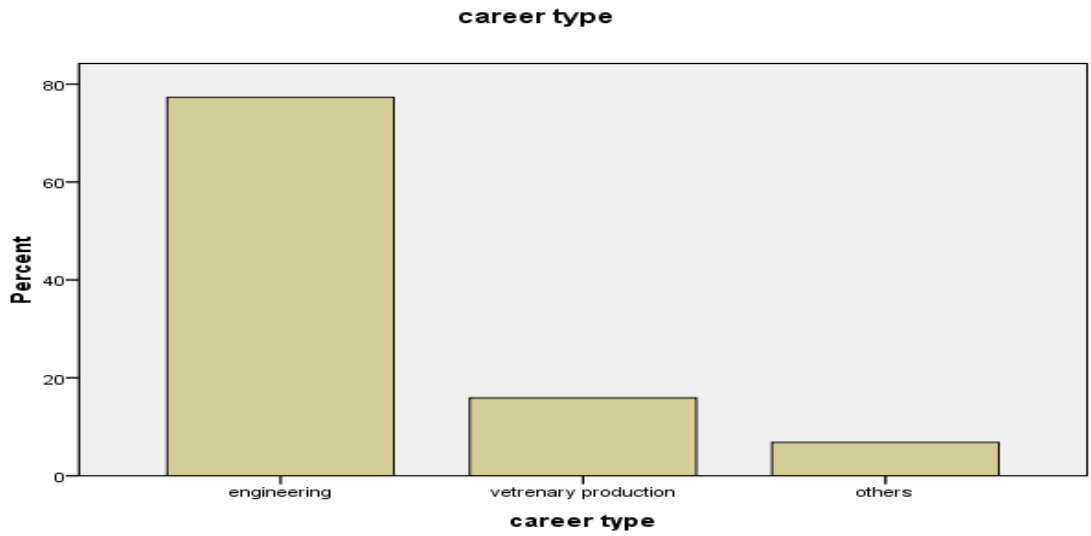
N	Valid	44
	Missing	4
	Mean	1.3636
	Mode	1.00
	Std. Deviation	.80956
	Variance	.655

Table (17) the type of study sample where we observe that there are 44 individual is respondents and 4 of the sample is not respondents, the Mean is 1.3636, the Mode is 1.00 and the Standard Deviation is 0.80956

**Table 18 Career Type Frequency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	engineering	34	70.8	77.3	77.3
	veterinary production	7	14.6	15.9	93.2
	others	3	6.2	6.8	100.0
	Total	44	91.7	100.0	
	Missing System	4	8.3		
Total		48	100.0		

Table (18) figure (11) shows the distribution of career type of the study sample , where we observed that 34 individuals of the sample are engineering career given a percentage of 70.8%, 7 individuals are veterinary production given a percentage 14.6% , 3 individuals of the sample are others given a percentage 6.2% , this indicating that the incubators are working in the engineering field.



**Figure 11 Career Type**

**•Analyses of the Incubators Type:**

**Table 19 Incubators Type Statistics**

N	Valid	41
	Missing	7
	Mean	1.6341
	Mode	2.00
	Std. Deviation	.62274
	Variance	.388

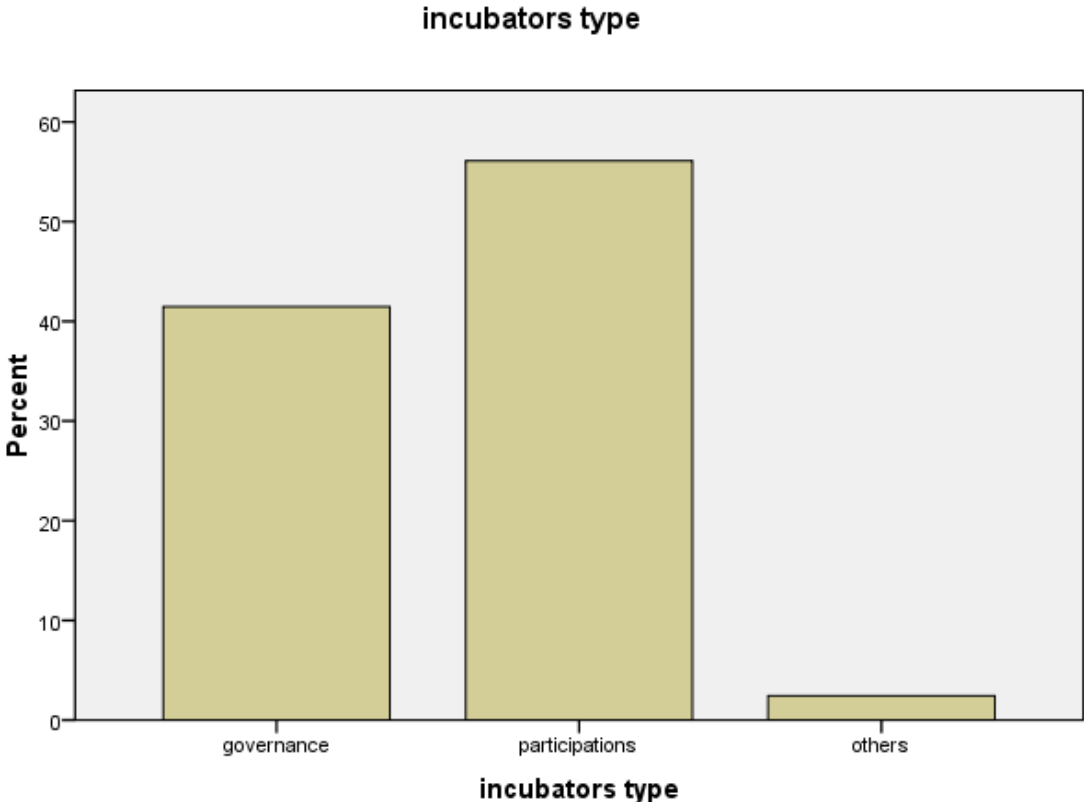
Table (19) shows the type of study sample where we observe that there are 41 individuals as respondents and 7 of the sample are not respondents, the Mean is 1.6341, the Mode is 2.00 and the Standard Deviation is 0.62274.

**Table 20 Incubators Type Frequency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	governance	17	35.4	41.5	41.5
	participations	23	47.9	56.1	97.6
	others	1	2.1	2.4	100.0
	Total	41	85.4	100.0	
Missing	System	7	14.6		
Total		48	100.0		



Table (20) figure (12) shows the distribution of incubators type of the study sample, where we observed that 23 individuals of the sample are participations given a percentage of 47.9%, 17 individuals are governance given a percentage 35.4% , 1 individual of the sample are others given a percentage 2.1%, this indicating that the incubators are working in participations type.



**Figure 12 Incubation Type**

**•Analyses of the Financing:**

**Table 21 Financing Statistics**

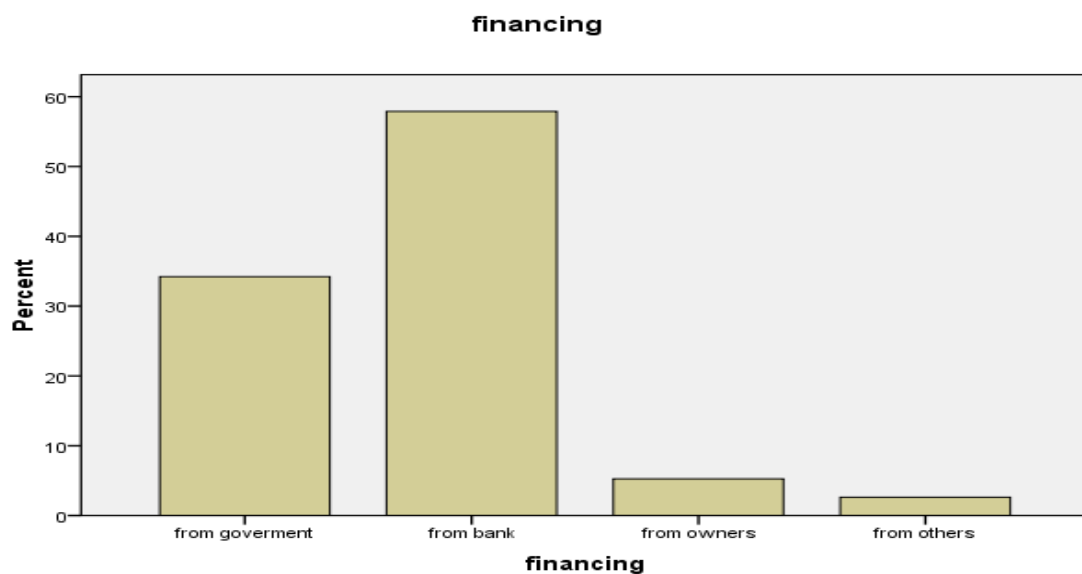
N	Valid	38
	Missing	10
	Mean	1.7632
	Mode	2.00
	Std. Deviation	.67521
	Variance	.456

Table (21) shows the type of study sample where we observe that there are 38 individuals as respondents and 10 of the sample are not respondents, the Mean is 1.7632, the Mode is 2.00 and the Standard Deviation is 0.67521.

**Table 22 Financing Frequency**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid from government	13	27.1	34.2	34.2
from bank	22	45.8	57.9	92.1
from owners	2	4.2	5.3	97.4
from others	1	2.1	2.6	100.0
Total	38	79.2	100.0	
Missing System	10	20.8		
Total	48	100.0		

Table (22) figure (13) shows the distribution of financing of the study sample, where we observed that 22 individuals of the sample are from bank given a percentage of 45.8%, 13 individuals are from government given a percentage 27.1%, 2 individuals of the sample are from owners given a percentage 4.2%, this indicating that the incubators depend on bank finance



**Figure 13 Financing**

•Analyses of budget:

**Table 23 Budget Statistics**

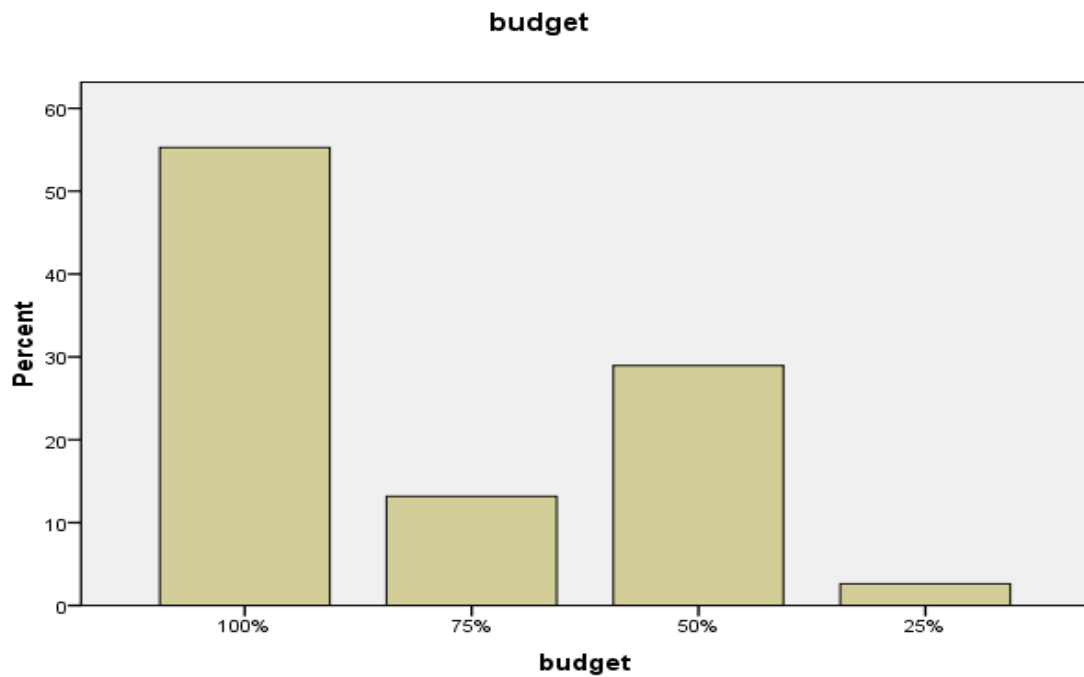
N	Valid	38
	Missing	10
	Mean	1.7895
	Mode	1.00
	Std. Deviation	.96304
	Variance	.927

Table (23) shows the type of study sample where we observe that there are 38 individuals who are respondents and 10 of the sample are not respondents, the Mean is 1.7895, the Mode is 1.00 and the Standard Deviation is 0.96304.

**Table 24 Budget Frequency**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100%	21	43.8	55.3	55.3
	75%	5	10.4	13.2	68.4
	50%	11	22.9	28.9	97.4
	25%	1	2.1	2.6	100.0
	Total	38	79.2	100.0	
Missing	System	10	20.8		
	Total	48	100.0		

Table (24) figure (14) shows the distribution of budget of the study sample, where we observed that 21 individuals of the sample show that the budget is 100% given a percentage of 43.8%, 11 individuals show that the budget is 50% given a percentage 22.9%, 5 individuals of the sample show that the budget is 75% given a percentage 10.4%, this indicating that the incubators budget is 100%



**Figure 14 Budget**

**•Test of Hypotheses:**

**•The first hypothesis (SMEs do not understand the definition or implications of TQM).**

**Table 25 Case Processing Summary for the 1<sup>st</sup> hypothesis**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
1st hypothesis * answers hypo1	692	96.1%	28	3.9%	720	100.0%

Table 25 shows the summary of the phrase answers for hypotheses 1 Table (25) show the type of study sample where observe that there are 692 valid answers with percent 96.1% , 28 missing answers with percent 3.9% of the sample.

**Table 26 answers hypo.1 Cross tabulation**

			answers hypo1				Total
			strongly disagree	disagree	agree	strongly agree	
1 <sup>st</sup> hypothesis	Phrase 1	Count	35	4	1	1	41
		% within 1 <sup>st</sup> hypothesis	85.4%	9.8%	2.4%	2.4%	100.0%
2	Phrase 2	Count	0	2	14	32	48
		% within 1 <sup>st</sup> hypothesis	.0%	4.2%	29.2%	66.7%	100.0%
3	Phrase 3	Count	1	1	15	31	48
		% within 1 <sup>st</sup> hypothesis	2.1%	2.1%	31.2%	64.6%	100.0%
4	Phrase 4	Count	0	7	16	25	48
		% within 1 <sup>st</sup> hypothesis	.0%	14.6%	33.3%	52.1%	100.0%
5	Phrase 5	Count	6	20	17	4	47
		% within 1 <sup>st</sup> hypothesis	12.8%	42.6%	36.2%	8.5%	100.0%
6	Phrase 6	Count	6	16	17	8	47
		% within 1 <sup>st</sup> hypothesis	12.8%	34.0%	36.2%	17.0%	100.0%
7	Phrase 7	Count	5	12	19	11	47
		% within 1 <sup>st</sup> hypothesis	10.6%	25.5%	40.4%	23.4%	100.0%
8	Phrase 8	Count	7	5	27	7	46
		% within 1 <sup>st</sup> hypothesis	15.2%	10.9%	58.7%	15.2%	100.0%
9	Phrase 9	Count	7	11	18	10	46
		% within 1 <sup>st</sup> hypothesis	15.2%	23.9%	39.1%	21.7%	100.0%
10	Phrase 10	Count	5	7	12	18	42
		% within 1 <sup>st</sup> hypothesis	11.9%	16.7%	28.6%	42.9%	100.0%
11	Phrase 11	Count	3	8	13	22	46
		% within 1 <sup>st</sup> hypothesis	6.5%	17.4%	28.3%	47.8%	100.0%
12	Phrase 12	Count	7	13	13	13	46
		% within 1 <sup>st</sup> hypothesis	15.2%	28.3%	28.3%	28.3%	100.0%
13	Phrase 13	Count	7	6	20	14	47
		% within 1 <sup>st</sup> hypothesis	14.9%	12.8%	42.6%	29.8%	100.0%
14	Phrase 14	Count	7	11	19	10	47
		% within 1 <sup>st</sup> hypothesis	14.9%	23.4%	40.4%	21.3%	100.0%
15	Phrase 15	Count	2	4	19	21	46
		% within 1 <sup>st</sup> hypothesis	4.3%	8.7%	41.3%	45.7%	100.0%
Total		Count	98	127	240	227	692
		% within 1 <sup>st</sup> hypothesis	14.2%	18.4%	34.7%	32.8%	100.0%

Table 26 shows that phrase 1 is (ISO 9000 Accreditation) has 35 individuals of the respondents are strongly disagree given a percent 85.5%, 4 individuals of the respondents are disagree given a percent 9.8 %, 1 is agree and other is strongly agree given a percent 2.4%.

Phrase 2 is (Organization management compulsory top manager to implement quality policy). 32 individuals of the respondent strongly agree given a percent 66.7%, 14 individuals of the respondent agree given a percent 29.2%, 2 individuals of the respondents are disagree given a percent 4.2 %.

Phrase 3 is (Organization management aim to customer satisfaction through, product quality, good price, easy delivery, and convincement). 31 individuals of the respondents are strongly agree given a percent 64.6%, 15 individuals of the respondents are agree given a percent 31.2 % and one disagree and other one strongly disagree given a percent 2.1 %each one.

Phrase 4 is (Organization management monitoring customer satisfaction through cash flow). Shows that 25 individuals of the respondents are strongly agree given a percent 52.1%, 16 of them are agree given a percent 33.3%, 7 individuals of the respondents are disagree given a percent 14,6%.

Phrase 5 is (Organization management devote employee per customer). Show 20 individuals of the respondents are disagree given a percent 42,6%, 17 of them are agree given a percent 36.2%, 6 are strongly disagree given a percent 12.8%, 4 are strongly agree given a percent 8.5%.

Phrase 6 is (Organization management interesting on the customer complaint available telephone, email, or box complaint). 17 individuals of the respondents are agree given a percent 36.2%, 16 individuals are disagree given a percent 34%, 8 individuals of them are strongly agree given a percent 17%, 6 individuals are strongly disagree given a percent 12.8%.

Phrase 7 is (Organization management transfers the complaint to their specialization offices to treating). 19 individuals of the respondents are agree given

a percent 40.4%, 12 individuals are disagree given a percent 25.5%, 11 are strongly agree given a percent 23.4%, 5 strongly disagree given a percent 10.6%.

Phrase 8 is (Organization management monitoring customer satisfaction through benchmarking). 27 individuals of the respondents are agree given a percent 58.7%, 7 individuals of the respondents are strongly disagree and strongly agree given a percent 15.2%, 5 of them are disagree given a percent 10.9% .

Phrase 9 is (Organization management interesting feedback from the customer through interviews or questionnaire). 18 individuals of the respondents are agree given a percent 39.1%, 11 are disagree given a percent 23.9%, 10 of them are strongly agree given a percent 21.7%, 7 are strongly disagree given a percent 15.2%.

Phrase 10 is (Organization management leads by example) 18 individuals of the respondents are strongly agree given a percent 42.9%, 12 of them are agree given a percent 28.6%, 7 are disagree given a percent 16.7%, 5 are strongly disagree given a percent 11.9%.

Phrase 11 is (Top management has a good relationship between management and workers, participate them their own occasions). 22 individuals of the respondents are strongly agree given a percent 47.8%, 13 individuals of the respondents are agree given a percent 28.3%, 8 of them are disagree given a percent 17.4%, and 3 are strongly disagree given a percent 6.5%.

Phrase 12 is (Top management has equity; justice and kindness is shown by management). 13 individuals of the respondents are give the same degree which in disagree, agree, and strongly agree given a percent 28.3%, 7 of them are strongly disagree given a percent 15.2%.

Phrase 13 is (Top management commitment to productivity) 20 individuals of the respondents are agree given a percent 42.6%, 14 individuals of the respondents are strongly agree given a percent 29.8%, 7 are strongly disagree given a percent 14.9%, and 6 are disagree given a percent 12.8%.

Phrase 14 is (Top management commitment to customer satisfaction through telephone, email, or complaint box). 19 are agree given a percent 40.4%, 11 are disagree given a percent 23.4%, 10 are strongly agree given a percent 21.3%, and 7 are strongly disagree given a percent 14.9%.

Phrase 15 is (Top management aligns jobs direct towards a common goal). 21 individuals of the respondents are strongly agree given a percent 45.7%, 19 are agree given a percent 41.3%, 4 are disagree given a percent 8.7%, and 2 are strongly disagree given a percent 4.3%.

From the above analysis showing that there are variance to the phrases mention in the first hypothesis, so in phrase 1 the domination is strongly disagree, phrases 2,3,4,10,11 and 15 the domination is strongly agree, phrase 5 is disagree, and phrases 6,7,8,9,13, and 14 the domination for agree degree, and at phrase 12 the domination are equally at disagree, agree, and strongly agree. So there is variance to the respondent's answers this indicates to acceptance the hypothesis.

- **Test of hypotheses by chi-square tests. The 1<sup>st</sup> hypothesis (SMEs do not understand the definition or implications of TQM).**

**Table 27 Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.182E2 <sup>a</sup>	42	.000
Likelihood Ratio	271.969	42	.000
Linear-by-Linear Association	2.386	1	.122
N of Valid Cases	692		

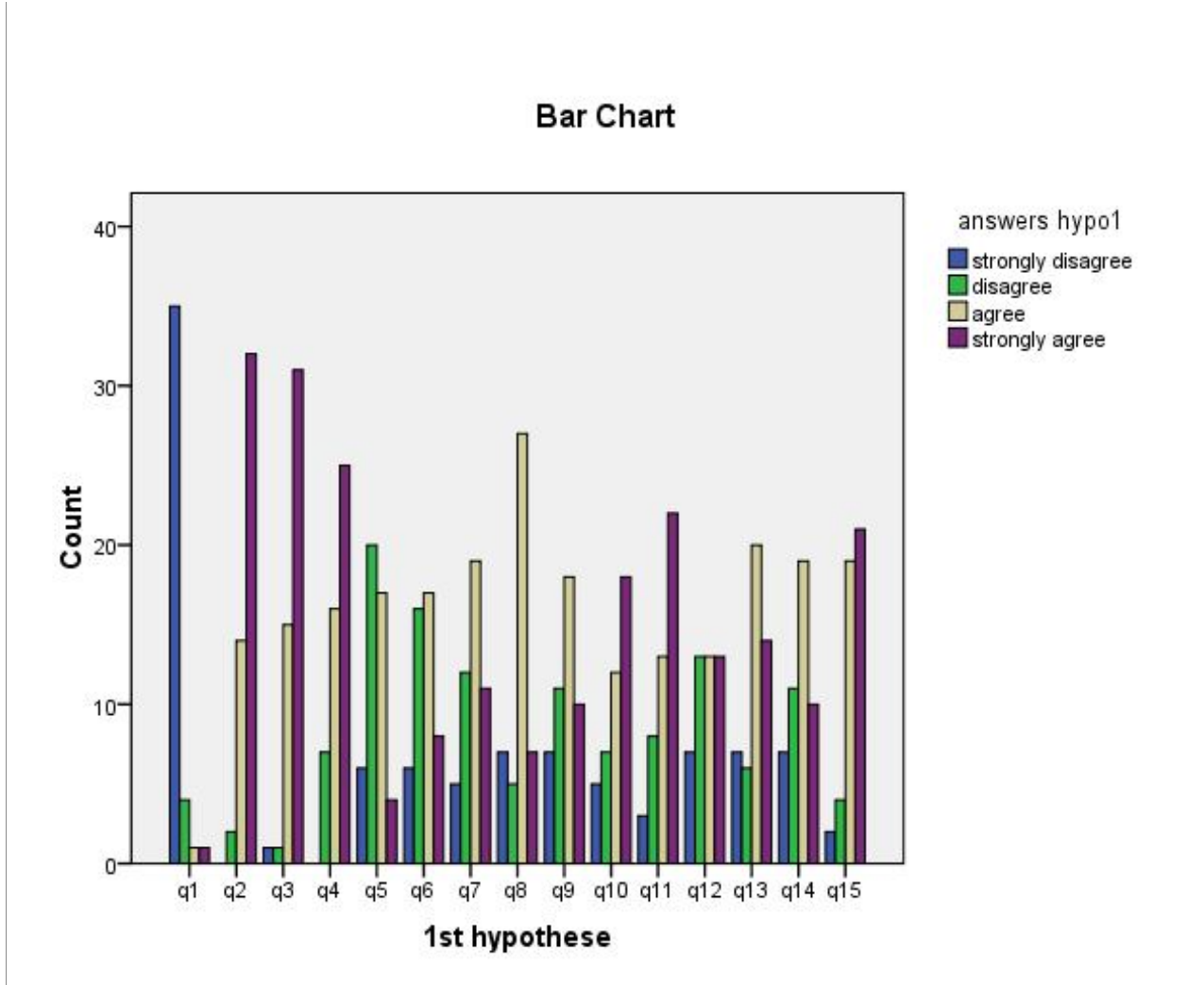
0 cells (.0%) have expected count less than 5. The minimum expected count is 5.81.

Table 27 shows the result of chi-square test for the first hypothesis where phrases were calculate by chi-square value for each phrase together with the degree of freedom and the probability value to see if there are statically significant differences



or not? The mode was calculated in order to see any trends indicating that there are differences, if any, in the phrases:-

First hypothesis which is (SMEs do not understand the definition or implications of TQM) The value of chi-square is 3.182E2 with degree of freedom 42 and the value of probability is 271.969 which is the value of significance in the sense that there are statistically significant differences in the opinions of the respondents about the phrase.



**Figure 15 A bar of 1st hypothesis**

Figure 15 shows that Q1 is strongly disagree, Q2,3,4,10,11 and Q15 the respondent are strongly agree, Q5 is disagree, Q6,7,8,9,13, and Q14 the respondent are agree, and at Q12 the respondent are equally at disagree, agree, and strongly agree. So there is variance to the opinion respondents

•Test of hypotheses the 2<sup>nd</sup> hypothesis (SMEs can be encouraged to implement TQM by a combination of training and mentoring).

**Table 28 Case Processing Summary for the 2<sup>nd</sup> hypothesis**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
2nd hypothesis * answers hypo2	380	99.0%	4	1.0%	384	100.0%

Table 28 shows the summary of the phrase answers for hypothesis 2 shows the type of study sample where we observe that there are 380 valid answers with percent 99% and 4 missing answers with percent 1% of the sample.

**Table 29 answers hypo.2 Cross tabulation**

			answers hypo2				Total
			strongly disagree	disagree	agree	strongly agree	
2nd hypothesis	Phrase 1	Count	15	15	5	13	48
		% within 2nd hypothesis	31.2%	31.2%	10.4%	27.1%	100.0%
	Phrase 2	Count	13	14	10	10	47
		% within 2nd hypothesis	27.7%	29.8%	21.3%	21.3%	100.0%
	Phrase 3	Count	16	12	11	9	48
		% within 2nd hypothesis	33.3%	25.0%	22.9%	18.8%	100.0%
	Phrase 4	Count	12	8	15	13	48
		% within 2nd hypothesis	25.0%	16.7%	31.2%	27.1%	100.0%
	Phrase 5	Count	14	9	10	15	48
		% within 2nd hypothesis	29.2%	18.8%	20.8%	31.2%	100.0%
	Phrase 6	Count	14	5	16	13	48
		% within 2nd hypothesis	29.2%	10.4%	33.3%	27.1%	100.0%
	Phrase 7	Count	34	4	3	7	48
		% within 2nd hypothesis	70.8%	8.3%	6.2%	14.6%	100.0%
	Phrase 8	Count	1	5	22	17	45
		% within 2nd hypothesis	2.2%	11.1%	48.9%	37.8%	100.0%
Total	Count	119	72	92	97	380	
	% within 2nd hypothesis	31.3%	18.9%	24.2%	25.5%	100.0%	

Table 29 shows that phrase 1 is (Organization management commitment to employee training implied in their policy). 15 individuals of the respondents are strongly disagree given a percent 31.2%, same rate disagree, 13 individuals of the respondents are strongly agree given a percent 27.1%, 5 is agree given a percent 10.4%.

Phrase 2 is (Organization management scheduled management training by date and kind.). 14 individuals of the respondent disagree given a percent 29.8%, 13 individuals of the respondent strongly disagree given a percent 27.7%, 10 individuals of the respondents are strongly agree ,and agree given a percent 21.3%.

Phrase 3 is (Organization management scheduled employee training by date and kind.). 16 individuals of the respondents are strongly disagree given a percent 33.3%, 12 individuals of the respondents are disagree given a percent 25 % and 11 agree given a percent 22.9% and 9 strongly agree given a percent 18.8 %.

Phrase 4 is (Organization management give employee's opportunities for growth and development). 15 individuals of the respondents are agree given a percent 31.2%, 13 of them are strongly agree given a percent 27.1%, 12 individuals of the respondents are strongly agree given a percent 25%, 8 are disagree given a percent 16.7%.

Phrase 5 is (Organization management keep special budget for employee training – Financial Commitment). 15 individuals of the respondents are strongly agree given a percent 31.2%, 14 of them are strongly disagree given a percent 29.2%, 10 are agree given a percent 20.8%, and 9 are disagree given a percent 18.8%.

Phrase 6 is (Organization management encourage employees to be updated on company progress). 16 individuals of the respondents are agree given a percent 33.3%, 14 individuals are strongly disagree given a percent 29.2%, 13 individuals of them are strongly agree given a percent 27.1%, 5 individuals are disagree given a percent 10.4%.

Phrase 7 is (Organization management have a policy to ensure employee welfare). 34 individuals of the respondents are strongly disagree given a percent 70.8%, 7 individuals are strongly agree given a percent 14.6%, 4 are disagree given a percent 8.3%, and 3 agree given a percent 6.2%.

Phrase 8 is (Organization management policy is workers are Self-disciplined). 22 individuals of the respondents are agree given a percent 48.9%, 17 individuals of the respondents are strongly agree given a percent 37.8%, 5 of them are disagree given a percent 11.1%, and 1 strongly disagree given a percent 2.2% .

From the above analysis showing that there are variance to the phrases mention in the second hypothesis, so there is no any domination obviously for all the phrases except phrase 7 which is the domination for strongly disagree (there is no welfare for employees).

So there is variance to the respondent's answers this indicates to acceptance the hypothesis.

**•Test of hypotheses by chi-square tests the 2<sup>nd</sup> hypothesis (SMEs can be encouraged to implement TQM by a combination of training and mentoring).**

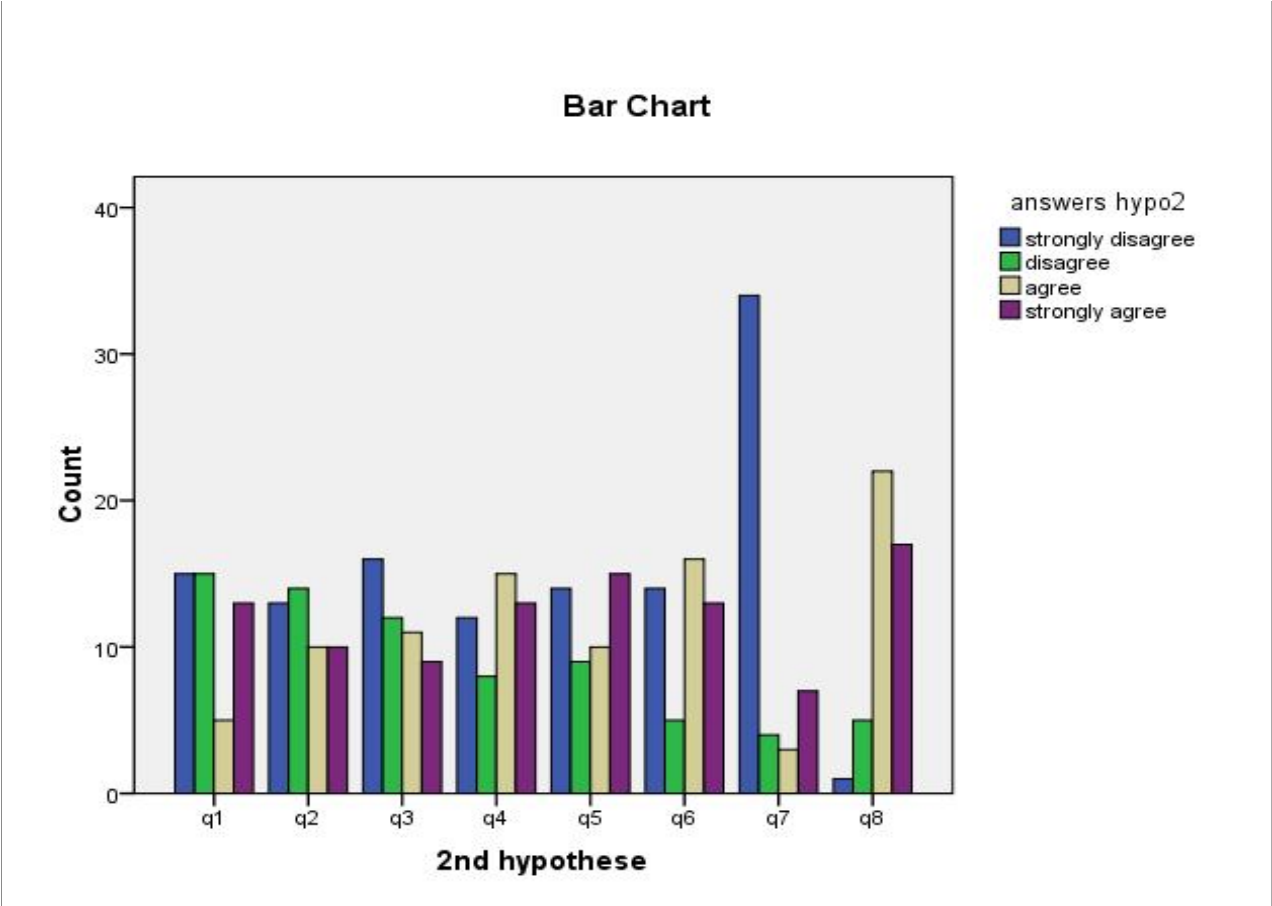
**Table 30 Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	82.475 <sup>a</sup>	21	.000
Likelihood Ratio	86.169	21	.000
Linear-by-Linear Association	2.112	1	.146
N of Valid Cases	380		

a.0 cells (.0%) have expected count less than 5. The minimum expected count is 8.53.

Table 30 shows the result of chi-square test for the second hypothesis where phrases were calculate by chi-square value for each phrase together with the degree of freedom and the probability value to see if there are statically significant

differences or not? The mode was calculated in order to see any trends indicating that there are differences, if any, in the phrases: Second hypothesis is (SMEs can be encouraged to implement TQM by a combination of training and mentor). The value of chi-square is 82.475 with degree of freedom 21 and the value of probability is 86.169 which is the value of significance in the sense that there are statistically significant differences in the opinions of the respondents about the phrase



**Figure 16 A bar chart of 2nd hypothesis**

Figure 16 shows that all phrases are equally or semi equal exception phrase 7 is (Organization management have a policy to ensure employee welfare) the domination is strongly disagree this mean the organization have no welfare for their employees. So there is variance to the opinion respondents.

- **Test of hypotheses the 3<sup>rd</sup> hypothesis (It is possible to benchmark management styles and the relative position of a company on route to TQM using the biological classification system.**

**Table 31 Case Processing Summary for the 3<sup>rd</sup> hypothesis**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
3rd hypothesis * answershypo3	333	99.1%	3	.9%	336	100.0%

Table 31 shows the summary of the phrase answers for hypothesis 3 show the type of study sample where we observe that there are 333 valid answers with percent 99.1% and 3 missing answers with percent 0.9% of the sample

**Table 32 answers hypo.3 Cross tabulation**

			answershypo3				Total
			strongly disagree	disagree	agree	strongly agree	
3rd hypothesis	Phrase 1	Count	0	1	14	32	47
		% within 3rd hypothesis	.0%	2.1%	29.8%	68.1%	100.0%
	Phrase 2	Count	1	9	13	24	47
		% within 3rd hypothesis	2.1%	19.1%	27.7%	51.1%	100.0%
	Phrase 3	Count	1	10	20	16	47
		% within 3rd hypothesis	2.1%	21.3%	42.6%	34.0%	100.0%
	Phrase 4	Count	0	5	26	17	48
		% within 3rd hypothesis	.0%	10.4%	54.2%	35.4%	100.0%
	Phrase 5	Count	3	9	21	15	48
		% within 3rd hypothesis	6.2%	18.8%	43.8%	31.2%	100.0%
	Phrase 6	Count	2	3	21	22	48
		% within 3rd hypothesis	4.2%	6.2%	43.8%	45.8%	100.0%
	Phrase 7	Count	2	5	14	27	48
		% within 3rd hypothesis	4.2%	10.4%	29.2%	56.2%	100.0%
Total	Count	9	42	129	153	333	
	% within 3rd hypothesis	2.7%	12.6%	38.7%	45.9%	100.0%	

Table 32 shows that phrase 1 is (Organization management, manage the resources co-ordinate for maximum efficiency). 32 individuals of the respondents are strongly agree given a percent 68.1% , 14 individuals of the respondents are agree given a percent 29.8%, 1 is disagree with percent 2.1%.

Phrase 2 is (Organization management encourage the esprit de corps (Teamwork)). 24 individuals of the respondents strongly agree given a percent 51.1%, 13 individuals of the respondent agree given a percent 27.7%, 9 individuals of the respondents are disagree given a percent 19.1% , 1 strongly disagree given a percent 2.1%.

Phrase 3 is (Organization management adopt the policy of specialization of labor). 20 individuals of the respondents are agree given a percent 42.6%, 16 individuals of the respondents are strongly agree given a percent 34% 10 are disagree given a percent 21.3% 1 strongly disagree given a percent 2.1 %.

Phrase 4 is (Organization management seeking highly skilled workers). 26 individuals of the respondents are agree given a percent 54.2%, 17 of them are strongly agree given a percent 35.4%, 5 individuals of the respondents are disagree given a percent 10.4%.

Phrase 5 is (Organization management give detailed Instructions of the work). 21 individuals of the respondents are agree given a percent 43.8%, 15 of them are strongly agree given a percent 31.2%, 9 are disagree given a percent 18.8%, 3 are strongly disagree given a percent 6.2%.

Phrase 6 is (Organization management acquainting workers responsible for own output). 22 individuals of the respondents are strongly agree given a percent 45.8%, 21 individuals are agree given a percent 43.8%, 3 individuals of them are disagree given a percent 6.2%, 2 individuals are strongly disagree given a percent 4.2%.

Phrase 7 is (Organization management received daily performance chart used to monitor performance of workers). 27 individuals of the respondents are strongly

agree given a percent 56.2%, 14 individuals are agree given a percent 29.2%, 5 are disagree given a percent 10.4%, and 2 strongly disagree given a percent 4.2%.

From the above analysis showing that there are variance to the phrases mention in the third hypothesis, so there is domination at the phrases 1,2 and 7 for strongly agree, and domination at 3,4,5 for agree, phrase 6 is equally for strongly agree and agree. Strongly disagree and disagree their percent is poor. So there is variance to the respondent's opinions this indicates to acceptance the hypothesis.

- **Test of hypotheses by chi-square tests the 3<sup>rd</sup> hypothesis (It is possible to benchmark management styles and the relative position of a company on route to TQM using the biological classification system).**

**Table 33 Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.106 <sup>a</sup>	18	.007
Likelihood Ratio	39.444	18	.002
Linear-by-Linear Association	2.015	1	.156
N of Valid Cases	333		

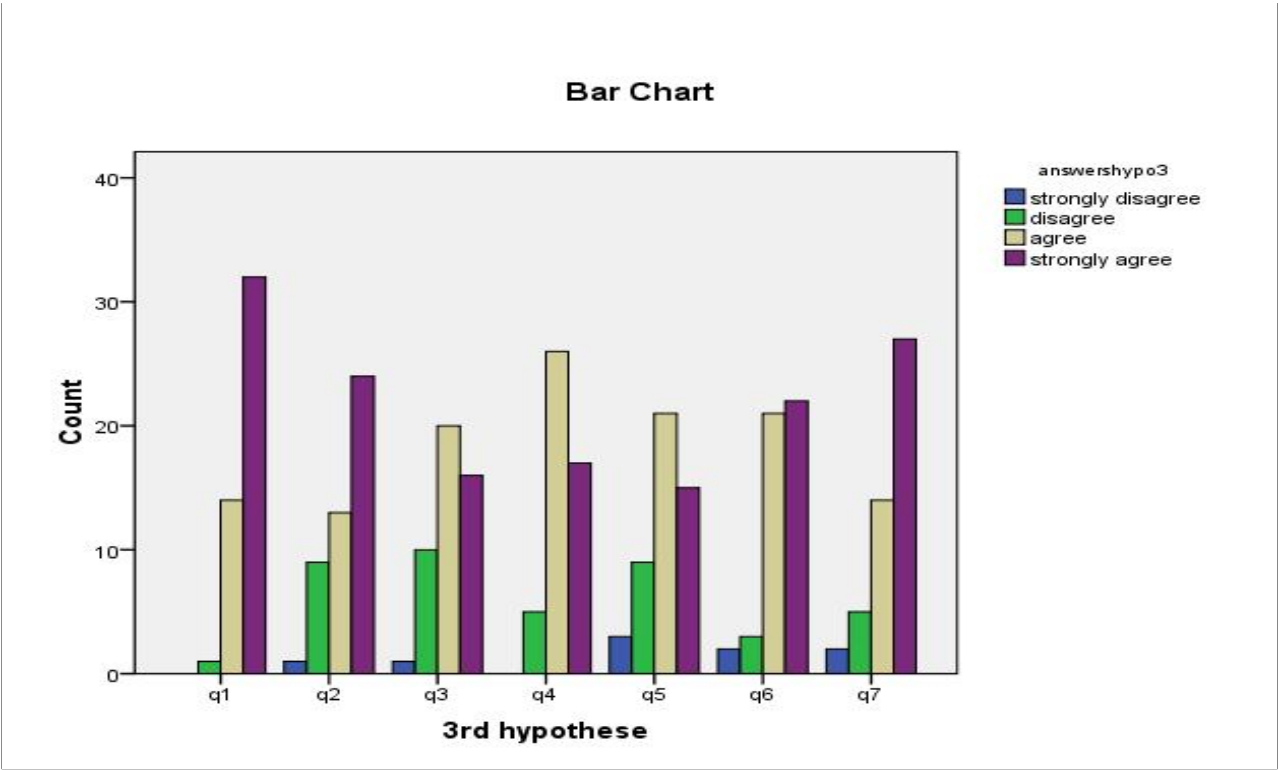
a.7 cells (25.0%) have expected count less than 5. The minimum expected count is 1.27.

Table 33 shows the result of chi-square test for the second hypothesis where phrases were calculate by chi-square value for each phrase together with the degree of freedom and the probability value to see if there are statically significant differences or not? The mode was calculated in order to see any trends indicating that there are differences, if any, in the phrases:

Third hypothesis is (It is possible to benchmark management styles and the relative position of a company on route to TQM using the biological classification system.).



The value of chi-square is 36.106 with degree of freedom 18 and the value of probability is 39.444 which is the value of significance in the sense that there are statistically significant differences in the opinions of the respondents about the phrase



**Figure 17 A bar chart of 3<sup>rd</sup> hypothesis**

Figure 17 shows that phrases 1, 2, and 7th the domination is strongly agree, and phrases 3, 4, and 5 the domination is agree. So there is variance to the opinions of the respondents. This is emphasizes the hypothesis.

- **Test of hypotheses: the 4<sup>th</sup> hypothesis (The greater focus on shared services provided by incubators, the more success).**

**Table 34 Case Processing Summary for the 4<sup>th</sup> hypothesis**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
4th hypothesis * answershypo4	659	98.1%	13	1.9%	672	100.0%

Table 34 shows the summary of the phrase answers for hypothesis 4 Table (15) shows the type of study sample where we observe that there are 659 valid answers with percent 98.1% and 13 missing answers with percent 1.9% of the sample.

**Table 35 answers hypo4 Cross tabulation**

			answershypo4				Total
			strongly disagree	disagree	agree	strongly agree	
4th hypothesis	Phrase 1	Count	1	1	12	34	48
		% within 4th hypothesis	2.1%	2.1%	25.0%	70.8%	100.0%
	Phrase 2	Count	1	0	15	32	48
		% within 4th hypothesis	2.1%	.0%	31.2%	66.7%	100.0%
	Phrase 3	Count	3	3	15	26	47
		% within 4th hypothesis	6.4%	6.4%	31.9%	55.3%	100.0%
	Phrase 4	Count	0	4	18	25	47
		% within 4th hypothesis	.0%	8.5%	38.3%	53.2%	100.0%
	Phrase 5	Count	15	16	9	8	48
		% within 4th hypothesis	31.2%	33.3%	18.8%	16.7%	100.0%
	Phrase 6	Count	6	11	19	12	48
		% within 4th hypothesis	12.5%	22.9%	39.6%	25.0%	100.0%
	Phrase 7	Count	8	3	26	10	47
		% within 4th hypothesis	17.0%	6.4%	55.3%	21.3%	100.0%
	Phrase 8	Count	3	9	26	10	48
		% within 4th hypothesis	6.2%	18.8%	54.2%	20.8%	100.0%
	Phrase 9	Count	1	6	12	27	46
		% within 4th hypothesis	2.2%	13.0%	26.1%	58.7%	100.0%
	Phrase 10	Count	0	14	18	16	48
		% within 4th hypothesis	.0%	29.2%	37.5%	33.3%	100.0%
	phrase 11	Count	2	8	22	15	47
		% within 4th hypothesis	4.3%	17.0%	46.8%	31.9%	100.0%
	Phrase 12	Count	1	5	20	20	46
		% within 4th hypothesis	2.2%	10.9%	43.5%	43.5%	100.0%
	Phrase 13	Count	0	8	17	20	45
		% within 4th hypothesis	.0%	17.8%	37.8%	44.4%	100.0%
	Phrase 14	Count	1	8	19	18	46
		% within 4th hypothesis	2.2%	17.4%	41.3%	39.1%	100.0%
Total	Count	42	96	248	273	659	
	% within 4th hypothesis	6.4%	14.6%	37.6%	41.4%	100.0%	

Table 35 shows that phrase 1 is (Organization is a Pyramid) 34 individuals of the respondents are strongly agree given a percent 70.8%, 12 individuals of the respondents are agree given a percent 25%, 1 is disagree and other is strongly disagree given a percent 2.1%.

Phrase 2 is (Jobs are Directed towards a Common Goal). 32 individuals of the respondent strongly agree given a percent 66.7%, 15 individuals of the respondents agree given a percent 31.2%, and 1 individuals of the respondents are strongly disagree given a percent 2.1 %.

Phrase 3 is (Centralization of Authority). 26 individuals of the respondents are strongly agree given a percent 55.3%, 15 individuals of the respondents are agree given a percent 31.9 % and 3 disagree and other 3 strongly disagree given a percent 6.4 % each one.

Phrase 4 is (Organization management used the Scalar Chain (Chain of Command)). 25 individuals of the respondents are strongly agree given a percent 53.2%, 18 of them are agree given a percent 38.3%, 4 individuals of the respondents are disagree given a percent 8.5%.

Phrase 5 is (Organization management adopt job rotation to avoid monotony). 16 individuals of the respondents are disagree given a percent 33.3%, 15 of them are strongly disagree given a percent 31.2%, 9 are agree given a percent 18.8%, and 8 are strongly agree given a percent 16.7%.

Phrase 6 is (Organization management seeking continuous improvement of service). 19 individuals of the respondents are agree given a percent 39.6%, 12 individuals are strongly agree given a percent 25%, 11 individuals of them are disagree given a percent 22.9%, and 6 individuals are strongly disagree given a percent 12.5%.

Phrase 7 is (Organization management supporting communication of company policy and future development, etc.). 26 individuals of the respondents are agree

given a percent 55.3%, 10 individuals are strongly agree given a percent 21.3%, 8 are strongly disagree given a percent 17%, and 3 disagree given a percent 6.4%.

Phrase 8 is (Organization management benchmarking of customer satisfaction). 26 individuals of the respondents are agree given a percent 54.2%, 10 individuals of the respondents are strongly agree given a percent 20.8% , 9 disagree given a percent 18.8%, and 3 of them are disagree given a percent 6.2% .

Phrase 9 is (Documentation of Work Procedures). 27 individuals of the respondents are strongly agree given a percent 57.7%, 12 agree given a percent 26.1%, 6 disagree given a percent 13%, 1 is strongly disagree given a percent 2.2%.

Phrase 10 is (Good Level of Communication Between Management and Workers) 18 individuals of the respondents are agree given a percent 37.5%, 16 of them are strongly agree given a percent 33.3%, 14 disagree given a percent 29.2%.

Phrase 11 is (Flexibility to adapt to new industry and market trends). 22 individuals of the respondents are agree given a percent 46.8%, 15 individuals of the respondents are strongly agree given a percent 31.9%, 8 disagree given a percent 17%, 2 are strongly disagree given a percent 4.3%.

Phrase 12 is (Working Closely with suppliers). 20 individuals of the respondents are give the same degree which in agree, and strongly agree given a percent 43.5%, 5 disagree given a percent 10.9%, 1 individual of the respondent strongly disagree given a percent 2.2%.

Phrase 13 is (Mutuality of Interest) 20 individuals of the respondents are strongly agree given a percent 44.4%, 17 individuals of the respondents are agree given a percent 37.8%, 8 are disagree given a percent 17.8%.

Phrase 14 is (The supplier and partnering processes are well managed to ensure that the corroboration goal can be achieved and improved to meet the requirement of the company.) 19 are agree given a percent 41.3%, 18 are strongly agree given a

percent 39.1%, 8 are disagree given a percent 17.4%, 1 is strongly disagree given a percent 2.2%.

From the above analysis showing that there are variance to the phrases mention in the first hypothesis, so in phrases 1,2,3,4,9 and 13 the domination is strongly agree, phrase 5 the domination is disagree, phrases 6,7,8,10 and 11 the domination is agree, and phrase 12 the domination are equally between agree, and strongly agree.

So there is variance to the respondent's answers this indicates to acceptance the hypothesis.

- **Test of hypotheses by chi-square tests the 4<sup>th</sup> hypothesis (The greater focus on shared services provided by incubators, the more success).**

**Table 36 Chi-Square Tests**

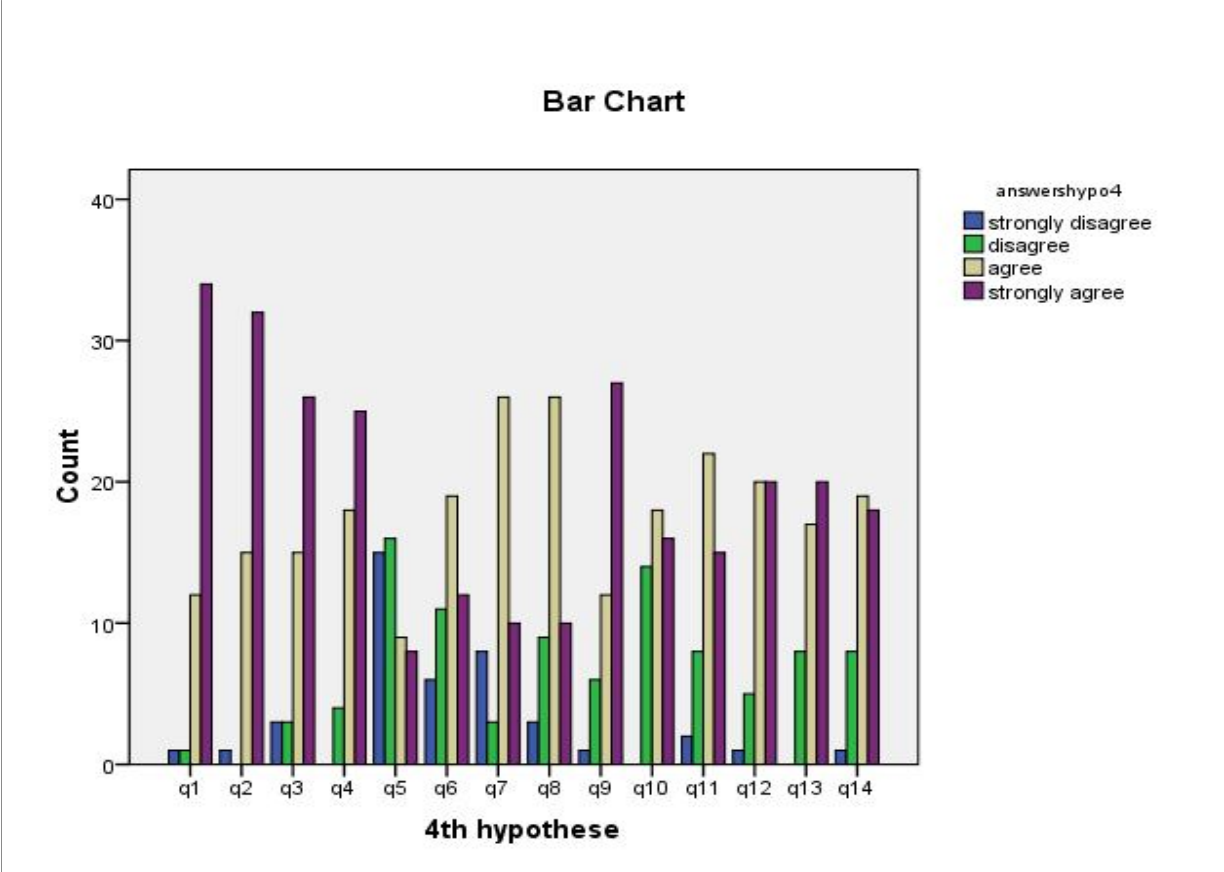
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.785E2 <sup>a</sup>	39	.000
Likelihood Ratio	171.650	39	.000
Linear-by-Linear Association	3.708	1	.054
N of Valid Cases	659		

a. 14 cells (25.0%) have expected count less than 5. The minimum expected count is 2.87.

Table 36 shows the result of chi-square test for the fourth hypothesis where phrases were calculate by chi-square value for each phrase together with the degree of freedom and the probability value to see if there are statically significant differences or not? The mode was calculated in order to see any trends indicating that there are differences, if any, in the phrases:-

Fourth hypothesis is (The greater focus on shared services provided by incubators, the more success). The value of Pearson chi-square is 1.785E2 with degree of freedom 39 and the value of probability is 171.650 which is the value of significance

in the sense that there are statistically significant differences in the opinions of the respondents about the phrases.



**Figure 18 A bar chart of 4<sup>th</sup> hypothesis**

Figure 18 shows that phrases 1, 2, 3, 4, 9 and 13 , the domination is strongly agree, phrase 5 the domination is disagree, phrases 6, 7,8, 10,11and 14, the domination is agree, and phrase 12 the domination are equally between agree, and strongly agree . So there is variance to the opinions of the respondents. This is emphases the hypothesis.

# Chapter 6

## Conclusions and Recommendations

### 6.1 Introduction

The focus of this research has been centered on the implementation of TQM in the cement produced incubator. The research was primarily mooted to establish the reasons why the incubator cannot successfully implement TQM within their operational environments. The researcher seeks to explore both the internal and external factors that could contribute to the reasons for a lack of TQM implementation within the incubator. The survey was, conducted with four incubators seeking for progressing their work towards TQM. After the analysis of the questionnaire demonstrate the strengths and the weaknesses points for the lacking of the implementation of TQM at the incubators processes.

The lack of successful implementation of TQM in the incubators or SME's is culminating in a degradation of the quality of the industry. Within Sudan SME's, there is a lack of quality management systems being implemented. The research returned that there are no incubators or SME's are accredited and this is far away from the appetite of the global market. Almost there is a desire for implementation of TQM at all organization but there are some obstacles cease these desires appear on misunderstanding what is TQM, top management is not commitment for implement TQM, and lacking of training, all these lead to lacking of deployment of TQM culture.

The research had discussed four hypotheses (refer to paragraph 1.8) through the analysis of the questionnaire by SPSS program showed that top management have a desire to implement TQM at their organizations but they have no idea of the principles of TQM, some of them to stick to hold TQM but haven't knowledge, the implementation come deformity, it is essential to encouraged training for the employees and managers towards TQM and monitoring processes to going on the alignment towards TQM, to be in progressing in the implementation of TQM

importance to management by benchmarking with other organization, and finally emphasizes in concentrated in the services to reach customer satisfaction which is the aims.

The research reply the questions (refer to paragraph 1.9) when the organization implement TQM it will gain more benefits specially at financials, and easy to study and changing according to market required, and easy in solving any emerge problem, so customer satisfaction should be verifying, and employee satisfaction also should be verifying, so working is going organize, and finally insuring deployment of TQM through organization.

## **6.5 Conclusions**

The main objectives of this study were to determine the constraints to TQM implementation within incubators and SME's in Sudan. The survey conducted within SME's provides positive feedback with respect to the quality process, but the following barriers had been identified: Lack of employee involvement in decision-making, miscommunication between management and employees and the dissatisfaction of employees within companies, unaware of TQM, in which all of the above are one of the fundamental requirements to successful implementation of TQM.

Research demonstrated that the fundamental reasons for failure in quality programs are the lack of clearly shared mental mode of quality throughout the incubators, and the lack of shared values and vision for the incubators, implementation of TQM in incubators is that as a rule, the responsibility for implementing TQM process is given to quality manager or quality department. Not involving anyone in the incubators. In addition TQM is not part of line management responsibility, or integrated into the strategic plan of the incubators. Although many SME's like and agree to the idea of TQM, they are not willing to or sufficiently competent to implement it effectively, Leaders and managers within SME's often lack the expertise and training necessary to assimilate and apply complex models and methodology, most SME's suffer from resource constraints and management



weakness. The major disadvantages of SME's are their lack of strategic thinking, SME strategy formulation and linkage to operations is a very dynamic process. SME's find themselves in an ever-increasing market turbulence as secured niche markets are on an ongoing basis being encroached upon by large organisations. Furthermore, SME customers demand higher quality at lower cost. lack of education is also one of the reasons why TQM would fail, adding, corruption, negligence and irresponsibility as critical issues to TQM success. Resource limitations and resistance to change can affect the introduction of TQM within SME's, which is attributed to workers who believe that change will threaten their current positions

## **6.6 Recommendations**

The conclusion of this research gets a recommendation which is made to mitigate the research problem and provide answers to the research question, according to the analysis of the questionnaire.

- 1- Accreditations processes need to be aligned to best suit both SME's and large organisations.
- 2- When accrediting an SME, accreditation bodies need to assign a mentor to ensure that the SME understand the requirements, and is able to maintain the quality system.
- 3- Enough allocation of time for training and assistance for SME's during accreditation process and after accreditation is needed to maintain the systems.
- 4- Sudan Government through the department of trade and industry need to ensure easy accessibility of funds for quality management systems and encourage SME's to implement quality management systems.
- 5- SME top management need to be committed to total quality management implementation.
- 6- SME's need to implement quality systems, for better management of their process.
- 7- Improve communication between management and employees to ensure a better understanding of the company objective
- 8- SME's to have a strategic plan, a quality plan and an operational plan.

9- SME has to ensure that all their processes are documented to ensure that there is a common understanding of process within different departments.

10- Based on the fact that SME's find it difficult to attract competitive staff, SME's need to focus on employee development.

11- Managers of SME's cite the cost of training and lost Production time as a major reason for not implementing TQM

## References:

- 1-BOYUN YUN, 2000. *Business Incubator Models in the U.S. and Korea* MSC Thesis. *School of public policy and management*. KDI
- 2-DONGLIN WU, February 2009. *Measuring Performance in Small & Medium Enterprises in the Information & Communication Technology Industries*. PHD Thesis: RMIT University
- 3-JENS J. DAHLGAARD; KAL KRISTENSEN and GOPAL K. KANJI, 1998. *Fundamentals of Total Quality Management Process Analysis and Improvement* .Printing press Taylor & Francis. Pages 357
- 4-JONAS HANSSON, Spring 2003. *Total Quality Management –Aspect of Implementation and Performance –Investigation with a Focus on Small Organizations*. PHD Thesis : LULEA University of Technology
- 5-KHALID ABED DAHLEEZ, October 2009. *The Role of Business Incubators in Developing Entrepreneurship and creating New Business Start-ups in Gaza Strip*. MSC Thesis: ISALMIC University Gaza
- 6-NONXUBA ADMINICAR NTOMBEEKAYA, September 2010. *The Application of TQM Within SME*. MSC Thesis: CAPE PENINSULA University
- 7-PANU BURANAJARUKORN; PETER R.GIBSON and GUENTER ARNDT, 2006. *The Problems of implementation of total quality management in Thai manufacturing SMEs*.*Research online*. :Wollongong University.
- 8-PHAIK LAN GOH, May 2000. *The implementation of total quality management in Small and Medium Enterprises*. PHD thesis: Sheffield University.
- 9-PHILIP KEMP, November 2013. *The Influence of Business Incubation in Developing New Enterprises in Australia*. MSC Thesis. Edith :Cowan University
- 10-SAMEER VERMA, January 2004. *Success Factors for Business An Empirical Study of Canadian Business Incubators*. MSC Thesis: CARLTON University
- 11-SONYA C.SMITH, September 2010. *Evaluating strategies to create successful business incubators in Massachusetts Gateway Cities*. MSC Thesis is Massachusetts Amherst.
- 12-ZULFIQAR DEO, 2010 *.Strategy Implementation Solution for a Medium Sized Company*. Degree Programme: IBMA HAAGA-HELIA University

# Appendix

## Questionnaire Form

بسم الله الرحمن الرحيم

Sudan University of Science and Technology

College of graduate

Center of Excellence and Development

Dear Mr. / Mss. ....

### **Subject : Questionnaire**

This is a research to partially fulfill M.Sc. of TQM, the topic is (THE IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT (TQM) IN ENTERPRISES. Case Study, Incubator Technology, For Cement Product in Sudan University of Science and Technology.

To integrate the scientific research with the actual application the researcher needs to have answers for this questionnaire.

This will be confidential, and will be used for research purpose.

Thank you for your participation.

**First: Basic Data:**

1-Situation status :

Member of board of director                      Administrator                      Technician  
Financial Manager                      Labor                      others.....

2-Age :

Less than 25 years                      25 -35 years                      36 -45 years                      46 – 60 years  
more than 60 years

3-Qualifications:

Diploma                      Bsc                      post graduate diploma                      Msc                      Phd

4-Vocational colleagueship:

Sudanese colleagueship                      Arabic colleagueship                      British colleagueship  
American colleagueship                      others.....

5-Scientific specialization:

Engineering                      Administration                      Agricultural                      veterinarian  
others.....

6-Experience:

Less than 5 years                      5-10 years                      11-15 years                      16-20 years  
More than 21 years.

7- Career types:

Engineering                      veterinary production                      Agricultural production  
others.....

8-Incubators type:

Governance                      participations                      private                      others.....

9-Financing:

From government                      from bank                      from owners                      from  
others.....

10-Budget:

finance 100% to budget                      finance 75% to budget                      finance 50% to budget  
finance 25% to budget

**Second: Questionnaire:-**

Please put the sign ( ) for the suitable answer you agree, acquainting that numbers means as follows.

**STRONGLY AGREE (4) AGREE (3) DISAGREE (2) STRONGLY DISAGREE (1)**

Thank you for your participation.

No		4	3	2	1
	<ul style="list-style-type: none"> <li>• <b>1<sup>st</sup> hypotheses</b></li> <li>• <b>Incubator manager do not understand the definition or implications of TQM.</b></li> </ul>				
1	Organization management get the ISO 9000 Accreditation				
2	Organization management compulsory top manager to implement quality policy.				
3	Organization management aim to customer satisfaction through, product quality, good price, easy delivery, and convincement.				
4	Organization management monitoring customer satisfaction through cash flow.				
5	Organization management devote employee per customer.				
6	Organization management interesting on the customer complaint (available telephone, email, or box complaint).				
7	Organization management transfers the complaint to their specialization offices to treating.				
8	Organization management monitoring customer satisfaction through benchmarking.				
9	Organization management interesting feedback from the customer through interviews or questionnaire.				
10	Organization management leads by example				
11	Top management has a good relationship between management and workers, participate them their own occasions.				
12	Top management has equity; justice and kindness is shown by management.				
13	Top management commitment to productivity				
14	Top management commitment to customer satisfaction through telephone, email, or complaint box.				
15	Top management aligns jobs direct towards a common goal.				
	<ul style="list-style-type: none"> <li>• <b>2<sup>nd</sup> hypotheses</b></li> <li>• <b>Incubator manager can be encouraged to implement TQM by a combination of training and mentoring.</b></li> </ul>				
16	Organization management commitment to employee training implied in their policy.				
17	Organization management scheduled management training by date and kind.				
18	Organization management scheduled employee training by date and kind.				
19	Organization management give employees opportunities for growth and development				
20	Organization management keep special budget for employee training – Financial Commitment				
21	Organization management encourage employees to be updated on company progress				
22	Organization management have a policy to ensure employee welfare				

23	Organization management policy is (workers are Self-disciplined)				
	<ul style="list-style-type: none"> <li>• <b>3<sup>rd</sup> hypotheses</b></li> <li>• <b>It is possible to benchmark management styles and the relative position of a company on route to TQM using the biological classification system.</b></li> </ul>				
24	Organization management, manage the resources co-ordinate for maximum efficiency				
25	Organization management encourage the esprit de corps (Teamwork)				
26	Organization management adopt the policy of specialization of labor				
27	Organization management seeking highly skilled workers				
28	Organization management give a detailed Instructions of the work				
29	Organization management acquainting workers responsible for own output				
30	Organization management received daily performance chart used to monitor performance of workers				
	<ul style="list-style-type: none"> <li>• <b>4<sup>th</sup> hypotheses</b></li> <li>• <b>The greater focus on shared services provided by incubators, the more success.</b></li> </ul>				
31	Organization is a Pyramid				
32	Jobs are Directed Towards a Common Goal				
33	Centralization of Authority				
34	Organization management used the Scalar Chain (Chain of Command)				
35	Organization management adopt job rotation to avoid monotony				
36	Organization management seeking continuous improvement of service				
37	Organization management supporting communication of company policy and future development, etc.				
38	Organization management benchmarking of customer satisfaction				
39	Documentation of Work Procedures				
40	Good Level of Communication Between Management and Workers				
41	Flexibility to adapt to new industry and market trends				
42	Working Closely with suppliers				
43	Mutuality of Interests				
44	The supplier and partnering processes are well managed to ensure that the corroboration goal can be achieved and improved to meet the requirement of the company.				