Quality–What Does It Mean For Strategic Information Systems

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Abstract

The notion of quality in the information systems field is widely used with many unclear interpretations. This paper discusses how the concept of quality has been addressed in the literature of information systems (IS). It shows that most of the widely employed concepts of quality are inappropriate for information systems. Furthermore, they suffer from theoretical analysis of information systems, because they are not focusing on these. A new notion of quality, especially for strategic information systems is therefore proposed. It defines the quality of information systems as a phenomenon, which depends on *(1) the type of IS under planning, (2) the IS stakeholder group whose perspective is been considered, and (3) the time frame when the system is evaluated.*

1. Introduction

The quality concept is a commonly accepted term and it has been used widely, without a clear understanding of what it really means. There are a couple of definitions of quality but none of these definitions are directed towards information systems. In contrast, software quality has often been addressed and the notion of quality is clearer to a greater extent for software products development than for information systems.

Those who begin to learn about quality familiarize themselves with the names of Philip Crosby, Edward Deming, and Joseph Juran. These people have clearly defined quality and what it means in business management. Unfortunately, they are experts in quality management for organisations, not on information systems. While some of their ideas are suitable for information systems they still lack the precise focus on information systems.

There are also some acceptable quality models like Software Quality Metric (SQM), Goal Question Metric (GQM), and Standards (Pressman, 1994). While these models are suitable for software development in some cases, it does not explain what quality means especially in strategic information systems. The reason is that there are significant differences between software systems and information systems. Information systems include software most of the

time, but, they might also exist without software. Secondly, computer based information systems, commonly called information systems also include hardware and people. Thus, the definition of quality in software may not necessarily be suitable for information systems.

This paper addresses the concept of quality as discussed in the literature. Some criticism is provided on the many discussions on quality in the literature and why they are not applicable to information systems in general and strategic information systems in particular. This paper proposes a new definition of quality for strategic information systems.

How is quality defined, who determines the quality and how is it evaluated? These are questions that will be addressed in this paper. The paper is divided into the following sections, preceded by an introduction. Section 2 covers previous definitions of quality and some views of software quality in the literature. Section 3 presents criticisms of the previous definitions and concepts of quality. It also explains what strategic information systems are. This section also points out why it is important to develop a clear concept of strategic information systems. The new view of quality is presented in section four and, finally, conclusions are drawn in section five.

2. What Is Quality?

When everything would seem to be the matter of price, there lies still at the root of great business success the very much more important factor of quality... After that, and long way after comes cost. (Carnegie, 1920)

There is a variety of perspectives of quality, but each of these perspectives contributes to an integrative, systemic view of what it means to manage for quality (Pruett et al. 1996). Often people will describe quality as meaning that something is outstanding in an indefinable way: even though quality cannot be defined, you know what it is (Pirsig, 1974). This common perspective can be found even in organisations which already seem quality oriented. Pirsig (1974) asked the question that if generally quality cannot be defined what makes us think it exists? His answer was an old one derived from a philosophic school that called itself realism. He answered that a thing exists, if a world without it can't function normally. If we can show that a world without quality functions abnormally, then we have shown that quality exists, whether it is defined or not. He therefore subtracted quality from the description of the world as we know it.

He subtracted fine art (i.e. painting, etc.), and sports from the view of the world. He also subtracted quality from the market place, which implies that alcoholic drinks, tea, coffee and tobacco would vanish. He subtracts most luxuries things and he is left with pure science, mathematics and philosophy. By subtracting quality from the picture of the world as we know it, he had revealed the hidden importance of this term. The world can function without quality, but

life would be so dull as to be hardly worth living. In fact, it would not be worth living. The term "worth" is a quality term. Life without quality would be without any values or purpose at all.

Pirsig's (1974) notion of quality will, however, be used in defining quality later on in section four. While Pirsig discusses the notion of quality he never defines it. However, he remarks that by refusing to define quality he had placed it entirely outside the analytic process. If you can not define quality, there is no way you can subordinate it to any intellectual rule (1974, p.213). The remaining part of this section will discuss how others have viewed quality.

2.1. Quality Is Fitness For Use

Juran defines quality as fitness for use (Juran, 1988). He stresses a balance between product features and products free from deficiencies. According to Juran and Gryna (1988) the word product refers to the output of processes, and that includes goods as well as services. Features of a product are properties of that product designed to meet the customer's needs. Example of features include fuel consumption of a vehicle. Service organisations also process features, such as promptness of delivery or courtesy extended.

The second element of Juran's definition of quality addresses products free from deficiencies (e.g., error in invoices, factory scrap, late deliveries). These features make trouble for the customers and, as a consequence, they become dissatisfied.

Juran's definition of quality reflects his strong orientation towards meeting customers expectations. These people include the internal customers, those who deal with the product during the development stages, and the external customers, those who deal with the finished product.

2.2. Quality Is Conformance to Requirements

> *"Quality is free. It's not a gift, but it is free. 'Quality of a life' is a cliché because each listener assumes that the speaker means exactly what he or she, the listener, means by the phrase" (Philip Crosby, 1979).*

Quality means conformance to requirements (Crosby, 1979). Quality must be defined in measurable and clearly terms to help the organisation take action based on tangible targets, rather than on hunch, experience, or opinions. "Quality is an achievable, measurable profitable entity that can be installed once you have commitment and understanding and are prepared for hard work" (Crosby, 1979, p. 6).

According to Crosby, quality is either present or not present. There is no such thing as differing levels of quality. "Quality means conformance, non-quality means non-conformance" (p.45). Management must measure quality by continually tracking the cost of doing things wrong. Crosby refers to this as the price of non-conformance. To aid management in tracking

the cost of doing things wrong, he developed the following formula: Cost of quality (COQ) = Price of Conformance (POC) + Price of Non-conformance (PONC) (p.209)

The price of conformance refers to the cost of getting things done right the first time. Price of non-conformance provides the management with information of regarding the waste cost. Crosby pointed out five erroneous assumptions about quality. The first erroneous assumption is that quality means goodness, or luxury, or shininess, or weight. The second is that quality is an intangible and therefore not measurable. To Crosby, quality is precisely measurable by the oldest and most respected of measurements – cold hard cash. The third erroneous assumption is that there is an "economics" of quality. The fourth is that all the problems of quality are originated by the workers, particularly those in the manufacturing area. And lastly, that quality originates in the quality department.

2.3. Quality Is A Relative Term

Deming (1986) does not define quality in a single phrase. He asserts that the quality of any product or service can only be defined by the customers. The difficulty in defining quality is to translate future needs of the user into measurable characteristics, so that a product can be designed and turned out to give satisfaction at a price that the user will pay (Deming, 1986, p. 169).

Quality is a relative term that will change in meaning depending on the customers' needs. To meet or exceed the customers needs, managers must understand the importance of consumer research, statistical theory, statistical thinking, and the application of statistical methods to processes.

2.4. Quality Is People.

Fundamentally software quality is about people. This is what makes the subject both complex and interesting (Gillies, 1992). Gillies (1992) provides one of the most interesting definitions of software quality. His definition is that "Software quality is people" (p.15). He explains it with five points, as follows: (a) It is people and human organisations who have problems to be tackled by the computer software. (b) It is people who define the problems and specify the solutions. (c) It is still people who implement designs and produce code (d) It is still people that test the code (e) It is people who use the final systems and will make judgements about the overall quality of the solution.

He maintains that tools, processes and quality management systems are all aids to enhancing quality, provided that the people are capable and motivated towards their effective use.

2.5. Some Views Of Software Quality.

The concept of quality has been addressed from different points of view. Therefore, it is not surprising that software quality has been viewed according to a number of different perspectives. Sometimes these perspectives even conflict with one other. Each originates in a particular context, and any single one tends to provide only a partial view. One of the most common examples of this is the "user" view versus the "designer" view. These views are generally presented in adversarial pairs, such as user versus designer, as shown in Table 1. Other views identified include the project manager's, business analyst's, implementation programmer's, and the quality auditor's views (Gillies 1992).

VIEWS OF SOFTWARE QUALITY	
User	**Designer**
What I want	Good specification
Fast response	Technical correctness
Easy to use	Fits within system
Reacts to business change	Low maintenance
No errors	Correct data
Reliable	Common hardware base
Meets business objectives	
Contains all foreseeable requirements	
Flexible.	

Table 1. The conflicting views of users and developers (Adapted from Gillies, 1992).

In an attempt to classify different and conflicting views of software quality, Garvin (1984) suggested five different views of quality. Similarly Ehn (1995) presented the idea of quality-in-use. We shall first present the five views of quality according to Garvin (1984), and then Ehn's (1995) idea of quality-in-use.

The five views of quality according to Garvin (1984) are as follows:

(a) Transcendental view: This is the view that relates quality to innate excellence. Another word for this might be elegance. Pirsig's notion of quality comes dangerously close to the transcendental view of quality. This is the classical definition of quality, an example would be a Rolls-Royce automobile.

(b) Product-based view: Sometimes referred to as an economist's view – the higher the quality, the higher the cost. The basis for this view is that it costs money to build in quality. This is contradictory to Crosby's notion of quality which states that "quality is free" (Crosby, 1979, p.1).

However, this view finds support among software economists who point to the fact that 80% of software development costs are in maintenance. Quality of this type may be added to a product either by greater functionality or greater care in development leading to a high quality solution

(c) User-based view: This can be summarised as "fitness for purpose", a view first expressed by Juran. It is an important view of quality that has often been sacrificed by software designers in the past in favour of technical correctness. Some of the reasons expressed by software designers can be stated as follows: the users do not understand anything about software quality, and they certainly do not know what they want.

(d) The manufacture's view: The manufacture based view measures quality in terms of conformance to requirements. "This view is the most common amongst software engineers" (Gillies, 1992, p. 14). It is currently supported by many methodologies, computer-aided software engineering (CASE) tools and total quality management (TQM) schemes as proposed by Crosby (1979). It seems to be the easiest view of quality.

(e) Value-based view: This is the ability to provide what the customer requires at a price that they can afford. A good illustration of this view would be for example the Ford Escort and the Lada. Within software development, this view of quality as constrained by cost is better suited to a wider view of resources than simple financial cost. People, time and tools may all act as constraints upon the attainment of the desired level of quality.

To continue the above discussion we may look further at the concept of quality-in-use. Quality-in-use is sometimes referred to as actifacts-in-use, seen by Ehn et. al (1996) as the appropriate balance between the technology proper (structure), the contextual social utility of the actifact (function), and the subjective experiences from using the system (form). To him quality is a question of technical control, ethics, and aesthetics. Furthermore, this quality is determined during the use situation.

Ehn (1995) stresses that an IS is an artifact, which can be thought of in terms of form, function and structure. He associates form, function and structure with the quality perspective aesthetics, ethics and construction respectively. According to these views, form is explained as the experience of using IT-artifacts, function is the usefulness of the artifact and structure is understood as the material, which the artifact is composed of hardware and software.

"Aesthetics is the least developed quality perspective. It is commonly associated with outer beauty" (Ehn, 1995, p.152). Ehn noted that the aesthetic quality perspective is developed in approaches like "appropriate design". Ethical quality is the classical school of goodness. Relevant question is for whom is the IT-artifact good. This is a contextual quality perspective. There are many technical versions of the structure aspect. Typical examples are software metric or quality standards, e.g. ISO 9126 for program quality aspects like efficiency, error tolerance, etc.

3. What is Wrong With The Previous Definitions.

Since there is more than one previous definition we will examine them separately, starting with the least appropriate definition of quality and proceeding to the more suitable definitions. The least appropriate definition is the definition presented by Gillies (1992). Defining "quality as people" is vague and it suffers from conceptual understanding of both quality and people. Following Gillies argument for defining quality as people, we can as well define "success" as people. While his definition was addressing software quality, a closely related topic to information systems, it is highly inappropriate for any kind of information system and in particular strategic information systems.

Ehn (1995) did not clearly state what he meant by quality in a single phrase. Although he is discussing software and information systems, his explanation of quality is not satisfactory. He argues that IS is a design discipline. Therefore he adopts the designer viewpoint on quality which, is not adequate for information systems. Furthermore, he suggests that other viewpoints like "architecture, industry design, visual arts, film and literature" should be considered during designing. While these views are good in their own context they are not suitable for information systems and not for strategic information systems. Furthermore, his discussion was too philosophical for our purposes, with little focus on information systems.

Garvin (1984) pointed out five views of software quality. Most of these views are related to either Juran (1988), Crosby (1979), or Deming (1986). Therefore, instead of discussing Garvin the other three authors above will be discussed.

Juran defines quality as fitness for use. This is one important quality dimension for information systems, however it ignores other dimensions. Although information systems have to be fit for use, in other words useful, usefulness is not always the most important quality element in information systems. Moreover, the conceptual background of this definition comes from management. Therefore, the detailed analysis of the definition shows that it is not directly to information systems.

Crobsy (1979) defines quality as conformance to requirement. This definition is suitable for many products but not so much for information systems. It is accepted that it is crucial to adhere to requirements. The difficulty with this definition for information systems is that it does not say anything about whose requirements, and about changes in requirements. The changes in requirements is a function of time and the stakeholders whose requirements change.

Deming (1986) did not give any precise definition of quality but his concept of quality is very important. He asserts that the quality of any product or service can only be defined by the customers. While the idea that the customer should determine quality is good, the concept is not sufficient for information systems. This is because the "customer" (depending on who it is in

any case) is only one of the important stakeholders in information systems development. While the importance of the stakeholder can not be overemphasised, there are some other stakeholders that are also equally important for IS. These stakeholders are not covered in these definition. Furthermore, the focus of the definition is not on information systems.

In section four a new concept of IS quality will be presented which adopts the idea of Juran (1988), Crosby (1979) and Deming (1986) with modification to each. The next section however, explains why the focus is on strategic information systems in particular.

3.1. Why Strategic Information Systems (SIS)?

Over the past 25 years the role of IS has changed dramatically. First from administrative, to cost focused operation support systems, to various types of management support systems. These latter systems are designed to give the firm a competitive advantage and are best described as strategic information systems (SIS) (Remenyi, 1991). It is important that there will be much development in the area of SIS during the next few years as more and more firms begin to use their systems in this way.

Applying Porter's value chain concept, SIS is an IT application which helps a firm to improve its long-term performance by achieving corporate strategy, and thereby directly increasing its value-added contribution to the industry value chain. A SIS will give management an opportunity to increase the effectiveness with which a firm relates to and operates within its industry value chain. According to Wiseman (1985) SIS is an information system used to support or shape the competitive strategy of the organisation. SIS represents a new kind of information system, radically different in organisational use from those countenanced by the conventional perspective (Remenyi, 1991).

One should distinguish between the organisational uses and the technical functions of IS. Some of the uses to which an IS is put are conventional and some are strategic. The organisational use of an IS refers to whether it automates basic clerical processes, or satisfies informational needs, or supports and shapes competitive strategy. The technical function of an IS refers to whether it is a transaction processing system or an information processing system (Remenyi, 1991). Remenyi further explains that SIS may be either Management Information System (MIS) or Management Support System (MSS). A system is strategic if it directly supports or shapes the competitive strategy of an enterprise. See figure 1 below. SIS targets new user groups providing new benefits, which are not delivered by either MIS or MSS.

Use / Function	Automating Basic Processes	Satisfying Information needs	Supporting or Shaping Competitiv Strategy
Transaction Processing	MIS		SIS
Query and Analysis		MSS	

Figure 1 Adapted from Remenyi A taxonomy for IS

SIS links the IS effort directly to the business, gaining a competitive edge by finding, getting and keeping clients. It frequently requires the activities of information systems development (ISD) to be extended. It may require new hardware and software as well as additional personnel and an organisation and culture change. It is a major addition to the way the firm does business. "A SIS will generally change the focus of ISD from the function of application to the use of the applications, which may be seen as a shift from a features orientation to a benefits orientation" (Remenyi, 1991, p. 69).

Reponen (1993) noted that the concept of SIS has been widely used with many different interpretations, and sometimes the differences in meaning are not entirely clear. According to Reponen (1993, p.101) "SIS are information systems, which are designed to bring competitive advantage or have resulted in a competitive edge". He explained that competitive advantage may be achieved either through low costs or by superior service. See figure 2 below.

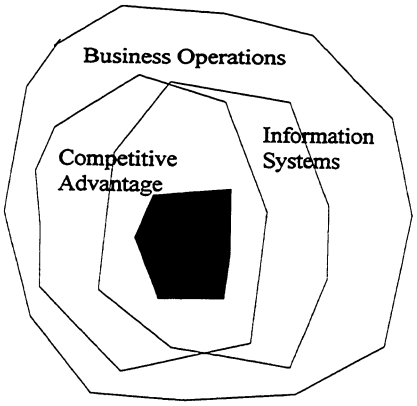

Figure 2 Adapted from Reponen, Concept of SIS.

From the discussion above, it is clear why SIS is interesting. Summarising the above points: (a) SIS are an important group of IS, because they provide competitive position to the organisations (Reponen, 93; Porter, 85; Wiseman, 85). (b) They are growing more and more, and thereby becoming more important (Remenyi, 91). (c) "Business information processing is the largest single software application area" (Pressman, 94, p.15) and SIS is becoming a crucial part of it. We therefore conclude that it is important to have a clear concept of what quality is in this largest growing area of the field of information systems.

4. The New View Of Quality

The business of quality management is not all that easy. It isn't that hard either, but it does encompass more than a single gulp of philosophy... The problem of quality management is not what people don't know about it. The problem is what they think they know... Everyone feels they understand it. Even though they wouldn't want to explain it. (Philip Crosby, 1979).

The notion of quality as seen from our point of view is that it is a multidimensional concept which is context dependent. First of all, the quality of any information system can be said to be a function of three dependent variables. They are the type of IS, the Stakeholder group, and Time. The quality of any information system can be determined from this concept. Figure 3 below shows the quality model and how the three variables determine the quality of information systems. The remaining part of this section answers the question: what determines the quality attributes of an information system, who identifies these attributes and how are the attributes evaluated.

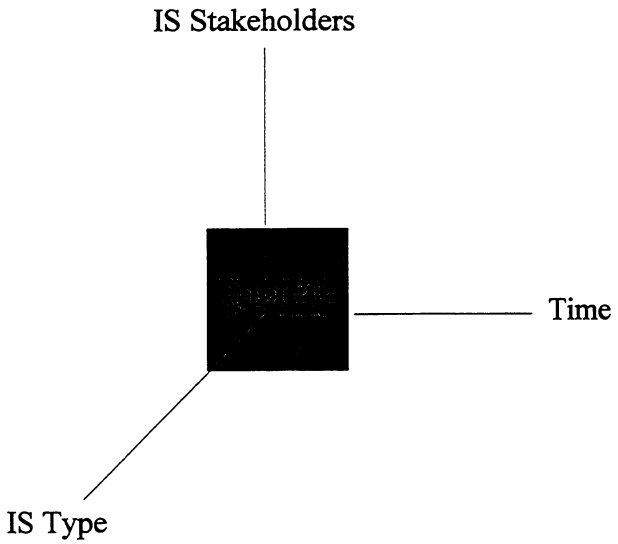

Figure 3. The Quality Model

We define the quality of information systems as a phenomenon which depends on *(1) the type of information system under planning, (2), the IS stakeholder group whose perspective is been considered, and (3) the time frame when the system will be evaluated.* Mathematically this can be expressed as Q = F(I,S,T) (i.e. Q: quality = is a F: function of I: type of information, S: stakeholder group, and T: Time)

4.1. Quality Is A Function Of The Type Of Information System

The answer to the question what determines the quality of an information system will be provided in this paragraph. The quality of information systems is not fixed and it means different things in different systems. There are several types of information systems, and each of these systems requires a particular set of quality attributes. Therefore, the quality of an information system is determined by the type of the system. For example, the quality attributes of expert systems will be different from the quality attributes of transaction processing systems, which in turn will be different from hospital information systems or airline reservation systems.

Strategic information systems that have similar objectives can even have different quality attributes. For instance Jelassi (1994) discusses several strategic information systems. Each of these systems needs a set of unique quality attributes, which were different from each other. However, all the systems discussed by Jelassi (1994) are strategic systems. The point is that each information system is more or less unique, therefore it also requires a unique quality set of attributes. The quality of an information system is a function of the type of the information system. To be more precise, the quality of a strategic information system in particular depends on the goal and objectives of the system. Either it focuses on the internal improvement, thereby offering better services, or on the external customer, thereby given better services or low cost. In conclusion: the objectives of a system will determine the type of the information system, which in turn will determine the quality attributes of the system.

4.2. Quality Is A Function Of The Stakeholder Group

To answer the question of who determines the ISs quality, it is the Stakeholder group. The quality of information systems, especially strategic systems, depend heavily on the stakeholder group. The stakeholder group is all those people who have invested interest in the information system. Earl (1989) noted that the stakeholder group for an information technology (IT) consists of the following people: Business users, Government, Manufactures, Customers, Suppliers, Consumers, Competitors, and Employees. Furthermore, Ruohonen (1995) identified two groups of stakeholders: external and internal stakeholders.

In this paper stakeholders refers to all possible categories of stakeholders. These people determine the quality attributes for information systems. This is because they are the only people who can actually do so. The stakeholder group has good understanding of the business goals and objectives. Stakeholders understand what type of information systems are needed to meet their business goals and objectives. These people can therefore determine the quality attributes suitable for the information systems. Actually, there is no other group like the stakeholder group in the IS development process that can determine the right quality elements for information systems.

The stakeholder group may not be able to speak the designer technical language, however, they should be able to explain their business needs in language that the designer can interpret in quality terms. In the past, software quality and information systems quality have been left to the designer to decide. However, it has been pointed out by several people that the designers are not the appropriate people to determine the quality attributes for information systems (Lederer and Sethi, 1992, Adelakun, 1997).

There is a tendency to let the designer handle quality issues because people assume that they are a technical subject. This assumption explains why the designer view of quality is often adopted. Strategic information systems planning (SISP) presents many complex technical questions, some of which deal with hardware, software, databases, and telecommunications technologies. However, "SISP is too important to delegate to technicians" (Lederer and Sethi, 92, p.69). Adelakun (1997) noted that the designer should be included as one of the stakeholder group members. This will enhance learning. The role of learning in strategic information systems has been highly emphasised in the IS literature, (e.g., Reponen, 94).

4.3. Quality Is A Function Of Time

Quality is one of several phenomena that are time dependent. Take, for example, a strategic information system which requires close architecture with high security today. After a few months or a few years it may require an open system with free and easy access to data and information. Systems developed in the 1970's are built around mainframes and they therefore require a particular set of quality factors. With the proliferation of PC's in the 1980s different quality factors were required. In the 1990's client-servers became common and systems were designed to suit these types of architecture. Nowadays there is Internet, and other similar networks, therefore systems are also designed to suit them. The point here is that quality requirements change with time. Systems change with time, and so does the system quality.

However, if we assume that technology is not an issue we have to change in any case as the technology changes, in other to remain competitive. Consider new business opportunities. New opportunities pose new challenges to organisations. In order to maximize these business

opportunities, especially if they are of strategic importance, an information system may be required with specific quality attributes. Such quality attributes are only valid as long as the situation prevails. Whenever the situation changes new quality attributes will be needed if the IS is still of strategic importance. It is very important to note that the quality of ISs is time dependent. ISs quality changes with time.

To answer the question how is ISs quality evaluated, it is evaluated as a time dependent variable. The pre-defined quality specified by the stakeholders will be used to evaluate the ISs when it is delivered. If the situation has changed, new quality should be defined, and the IS should be re-evaluated based on the newly specified qualities.

The time dimension in figure 3 is used as a bases for evaluation. The stakeholders' expectation of the system quality will be compared with the actual system quality when it is delivered. The cross average between the expected quality attributes at time T1 and the actual quality attributes at time T2 can be calculated. The result will show the gap between expected system quality and actual system quality.

Managers then have a clear target for improving effectiveness and reducing the gap between expectations and actual performance (Pitt and Watson, 1994). This is important because one reason for IS failure is that there is a gap between stakeholders expectations of the system and the actual performance of the system (Lyytinen and Hirschheim, 1988)

4.4. Five Common Quality Elements For Most Strategic Information Systems.

There are five common and important quality elements for most strategic information systems. These five quality elements include: Flexibility, Reliability, Availability, Adaptability and Correctness. A review of several strategic information systems in the literature shows that these five quality attributes are crucial for the success of ISs. Some of these elements have characteristics of others.

Flexibility: "The principle of ultimate IT flexibility assumes that information is available the moment it is needed, where it is needed, in any form in which it is needed: any way, anywhere, anytime"(Knoll and Jarvenpaa, 1994). Such flexibility is required because the organisation does not know what knowledge, resource, or tool will be required at any given point in time (Quinn, 1992). There are several views of flexibility, for example Keen (1991) indirectly discusses flexibility when he uses the terms "reach" and "range" as two dimensions of the IT platform. Reach represents the locations to which a platform can link and range represents the connectivity of information across systems. For example, Internet has more reach and range than a local area network. For our purpose, *flexibility is defined as the ease with which an IS can change to accommodate new opportunities*

Adaptability: The issue of adaptability arises when the same information needs to operate in a new environment with the same functionality. Adaptability is the *ability of the system to adjust to a new environment in a short time.* Though adaptability and flexibility may be close in meaning, a system that processes good adaptability quality may not be flexible in general

Availability: If a system is not available it can not be used in any case. *The availability of a system is a measure of the amount of time the system is actually capable of accepting and performing a user's work or task.* This is an important element because nowadays many organisations do not want to keep a DP department. They simply outsource most of their computing services including their information systems. It is extremely important for a strategic information system to be available, otherwise it is better not developed at all. Before a system can be used, good or bad, it has to be available whenever it is needed. Reliability and availability are closely related but an available system might not be reliable. For example, a system whose response time is slow is still available but not efficient, thereby reducing its total reliability.

Reliability: This is a question of *trust or integrity*. SIS must be reliable. SIS should have the ability to perform their functions correctly and completely without being aborted or corrupted. The reliability of a computer system consists of a combination of hardware, software, and human components. The reliability of this combination of components can be thought of as computer system reliability (Perry, 1991). Therefore, a piece of software that works correctly only explains part of the system reliability.

Reliability includes availability and adequacy of back-up and recovery procedures. A system that fails frequently but restarts quickly would have high availability, but low reliability. Reliability is a difficult attribute to measure precisely, the most common question is: How reliable should the system be? The answer is that it depends on the type of system and the objective of the system. The IS stakeholders need to determine the level of reliability.

Correctness: This quality attribute is also common among strategic information systems, especially decision support systems or management support systems. Correctness is the extent to which the system performs the specified task. Correctness is a quality attribute that goes with almost any information system. A system has to work correctly, otherwise it will give problems from time to time. Some systems are acceptable if they have 90-95% of correctness. However, there are some systems that strictly require 100% correctness. The degree of correctness in a system depends very much on the type of system.

4.5. What Next.

More literature will be reviewed in the next version of this paper. This review will include service quality as discussed in marketing literature. Some of the quality concepts discussed in

this paper have also been updated and those updates will also be reviewed. The quality framework developed in this paper will be evaluated empirically using case studies.

5. Conclusion.

This paper has discussed the concept of quality in information systems with special focus on strategic information systems. Quality is a multidimensional phenomenon that is also context dependent. While some of the other concepts of quality are acceptable they are insufficient for information systems. The concept of quality by Deming (1986) and the definition of quality by Crosby (1979) and Juran (1988) are examples of otherwise acceptable concepts and definitions, which however are not sufficient for defining information systems' quality. Therefore, a new concept of information systems quality was introduced. IS quality is viewed as a phenomenon which depends on (1) the type of IS under planning, (2), the IS stakeholder group, whose perspective is being considered, and (3) the time frame in which the system will be evaluated.

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