THE INFLUENCE OF THE DIMENSIONS OF QUALITY INFORMATION ON BUYER-SUPPLIER RELATIONSHIPS: ANALYSIS FROM THE SUPPLIER FIRM'S PERSPECTIVES

By:

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ABSTRAK

Kajian ini menunjukkan bagaimana kualiti informasi memainkan peranan yang penting di dalam sistem pengurusan rankaian pembekalan, terutama didalam perhubungan di antara pembeli dan pembekal. Berdasarkan kepada keadaan perdagangan yang kompetitif dan perubahan keadaan pasaran yang pantas, keupayaan syarikat untuk bergerak pantas adalah amat bergantung kepada sejauh mana kualiti informasi dapat di kongsi bersama di antara pembeli dan pembekal. Kajian ini bertujuan untuk mengenal pasti dimensi di dalam kualiti informasi yang penting dan berupaya mempengaruhi hubungan di antara pembeli dan pembekal yang mana akhirnya dapat meningkatkan prestasi syarikat di dalam sistem pengurusan rangkaian pembekalan. Kajian ini adalah berdasarkan kepada kajian soal selidik dimana sebanyak 145 borang soal selidik telah di hantar kepada pembekal-pembekal kepada 10 syarikat antarabangsa yang beroperasi di kawasan utara Malaysia dan sebanyak 59.3% daripada pembekal tersebut telah pun memberikan maklum balas dan menjawab soalan kaji selidik tersebut dengan lengkap. Data tersebut telah diguna pakai bagi kajian ini dan di dapati dari persepsi pembekal, semakin baik kualiti informasi, ia akan dapat mempengaruhi perhubungan di antara pembeli dan pembekal. Adalah di dapati kajian ini amat penting kepada pengurus strategik dan operasi syarikat di dalam menguruskan sistem informasi yang baik bagi kegunaan di masa hapadan.

ABSTRACT

This study introduces how information quality plays an important role in the supply chain management, particularly in the buyer supplier relationships. With the current trend of business competitiveness and robust changing environments, the ability for the companies to react fast will much depends on the quality of information that can be shared between the buyer and the supplier. This study is primarily undertaken to investigate what are the dimensions of information quality that are important in influencing the buyer-supplier relationships, and ultimately can increase firms' effectiveness in supply chain management. This study is also to understand and to see the relationship between the dimensions of information quality in buyer-supplier relationships. The independent variables for this study were those used to measure information quality, whereby the dependent variables for this study were those used to measure buyer-supplier relationships. This study was conducted by distributing the questionnaires to 145 respondents who are the major suppliers of 10 multinational companies in the northern region of Malaysia. With the responses rate of 59.3%, the data collected were analyzed using regression analysis. The findings revealed that from the suppliers perspective, the improvement of information quality in term of the appropriate amount of information, the believability of the information, the free error of information, the interpretability of the information, the reputation of the information and the security of the information have influenced the buyer-supplier relationships. This study is important for both operations and strategic managers. From the suppliers' perspective,

these managers need to recognize the central role design of better information and its overall spectrum of looking ahead on future initiatives.

CHAPTER 1

INTRODUCTION

1.0 Introduction

Information Quality (IQ) in supply chain management (SCM) has gained its importance recently due to its ability to reduce costs and increasing responsiveness in the supply chain (Mc Laren et al, 2004; Chopra & Meindl, 2001; Dagenais & Gaustchi, 2002). A more evident fact is based on financial experts of GXS, a leading provider of business-to-business (B2B) e-commerce, in which, the company gained USD325 million savings annually through the information quality of its supply chain activities (Gaithersburg, 2006). During the past decades, information quality has enabled many organizations such as Dell and Hewlett Packard, to successfully operate solid collaborative supply networks (Scott, 1993). As a consequence to these healthy experiences, UDEX has built a unique, on-demand product information quality solution that enables customers to eliminate costly errors in the supply chain, thus increasing sales and improving operational efficiencies (Gaithersburg, 2006). Thus, organizations increasingly find that they must rely on effective information to successfully compete in the global market and networked economy.

With regards to SCM, many researchers have given a lot of definitions on SCM. Among the popular one would be by Lambert et al (1998) in Global Supply Chain Forum

mentioned that SCM is the integration of key business processes from end user through original suppliers to add value and services to customer and stakeholders. The other definition that could be also stated here would be by Hanfield and Nicholas (1999) that SCM is the integration of activities, through improved supply chain relationship to achieve sustainable advantage. It is widely accepted in the literature that SCM is important for material and information flows relating to the transformation of the materials into value added products, and the delivery of the finished products through appropriate channels to customers and markets so as to maximize customer value and satisfaction. For example, the members of the chain can accurately identify optimal inventory levels, warehouse space, and inventory turnover if the shared information is good (Kaeli, 1990). The more complex the supply chain, however, the more critical are the efficient flows of information and materials between organizations within the chain.

This study, therefore, introduces how quality information plays an important role in supply chain management, particularly in the buyer-supplier relationships. As mentioned earlier that the information sharing among the members of the chain, particularly between buyer and supplier, will result on the big impact to the partnership in term of the business performance. As a result, increased attention has been paid to the question of how the long-term working relationships between suppliers and customers can be improved from quality information. This study will focus on analyzing the dimensions of the information quality from the supplier's perspective towards building a great partnership. The results could be used as a benchmark for the suppliers to redevelop their business planning and communication strategy.

1.1 Background

Ellram and Cooper (1990) indicated that successful working relationship with a long term orientation depending on several factors. In other words, the outcome of a successful working relationship is a function of a number of factors or elements. According to Zineldin (1998), these elements are, among others, communication (information), adaptation, coercive power, interdependence, innovation and improvements, internal cooperation, skills and performance of employees including managers, physical resources, promotion, quality, delivery and pricing of products/services, customer expectations and satisfaction, etc. In conjunction with this, the importance of information sharing in the supply chain been supported by Spekman et al., (1998) who have indicated another principal tenet of supply chain management is a willingness to share information. In other words, sharing the information is much depends upon the willingness of both parties to share in the information. It's more on the nature of the information that been delivered between both parties.

On top of this, Monezka et al., (1971) have indicated that two aspects of communication behaviors that address the extent to which the information exchanged is effective in a partnership include the level of information quality and participation. Both of these aspects of information sharing (quality and quantity) are required to successfully develop supplier partnerships. Information sharing refers to the extent to which critical and proprietary information is communicated to one's supply chain partner (Mohr and Spekman, 1994). Suppliers and customers can form joint development teams to improve

various aspects in the supply chain or suppliers can suggest changes that may lead to quality or cost improvements (Clark and Wheelwright, 1993).

Traditionally, companies in a supply network concentrate on the inputs and outputs of the processes, with little concern for the quality of shared information even though the information in the supply chains are known to impact firm performance (Handfield et al, 2004). Willcocks and Sauer (2000) also mentioned the importance of information quality, in which, they stressed that the gradual increments in the level of quality for the information sharing produce a positive increase in the local and global performance of the supply chain. Specifically, information quality is an essential element to improved supply chain performance. Without accurate sharing of information, firms are required to supplement the available information with other costs alternatives.

When the companies are willing to provide and share quality information with their supplier in their supply chain, theoretically certain risks can be reduced. With the current trend of business competitiveness and robust changing environments, the ability for the companies to react fast will be much depend on the quality of information can be shared between the buyer and the supplier. For example the forecasted demand from the buying firms is important information and should be accurate and reliable so that the supplier should know in order to forecast their production. By sharing this quality information, the buyer are hoping to get the materials on the right quantity and quality at the right time whereby the supplier will be able to prepared and support their customer effectively. By having such information it will improve the supply chain and will give benefit to both

parties. However, firms face a complex understanding whether the information received can ensure high level of quality, and whether the quality information is important in improving their relationships with other supply chain partners. Therefore, the influence of quality information on buyer-supplier relationships is interesting topic to study.

1.2 Research Problems

Increasingly competition is forcing organizations to be creative in their strategic efforts as businesses are learning to improve the way customers are served. Many organizations, therefore, seek competitive capabilities that would enable firms to exceed customers' perceptions, so that they can enhance market and financial performance (Hayes & Pisaro, 1994). Effective SCM systems allow rich information exchange, quick and reliable data availability, and easy access to business partners (Mukhopadhyay et al, 1995). This section, therefore, will help to understand the current situations, to explain the gaps, and to discuss why this study is relevant with the current business scenario.

Getting the quality information in the buyer-supplier relationships is very crucial to have a better result. Information such as material forecast, future build plan, delivery information etc will really help to improve the supply lines and interrupted business performance. In this technological age, managing the good and quality information will become more dominant. Pugsley et al (2000), in their study, showing that an economy-based knowledge emerging with information is essential for any ongoing organization. The globalization of products, services, markets and competition has increased the need

for flexibility, quality, cost effectiveness and timeliness (Hunter et. al., 2002). A key resource for attaining these requirements is information quality and it has revolutionized business practices and now plays a more central part of business strategies (Pollard & Hayne, 1998). In addition, Sauvage (2003) claimed that to fully satisfy the diversifying requirement of customers, many companies had improved their service efficiency by improving the quality of information. Chapman et al (2003) suggested that companies should pay more attention to information quality and the quality of information can only be implemented through technology, knowledge and relationship networks.

Fuld (1998) warned companies of the dangers of old data and irrelevant information and noted that poor information quality on the chain can create impacts to firms' business performance. Poor information quality can have a severe impact on the overall effectiveness of an organization. A leading computer industry information service firm indicated that it "expects most business process reengineering initiatives to fail through lack of attention to data quality." An industry Executive report noted that more than 60% of surveyed firms (500 Medium-size corporations with annual sales of more than $20 million) had problems with information quality (Wand & Wang, 1996).

In a traditional vision of the supply chains, demand flows up the chain and product flows in the opposite directions. Time delays, distorted demand signals and poor visibility of exceptional conditions result in critical information gaps and serious challenges for Supply Chain managers, including misinformation and ultimately, mistrust. For example, when the suppliers lose faith in the forecast they receive, they will respond by building up

inventory buffer to guard against demand uncertainty. The disruption that results from sudden changes in forecasted demand is amplified as it travels up through the supply chain (Lee et al., 1997; Chen et al., 1999). Despites the drawbacks of poor communication among the partners supply chain, Sarkis and Taluri (2004), have mentioned the importance of the communication systems. Their discussions only focused from the external point of view, in which, communications system that need to be considered by the companies must have certain criteria such as; communications speed, type of standard, security, reliability, transaction filtering, additional value added services, information access, various costs. In conjunction with this, the information obtained from these systems are the key factors that enable the competitive advantage, by cementing the relationships with the customers, enabling integration forwards and backwards in the industry value chain so that the quality of the product can be enhanced (Roberts & Mackay, 1998).

Consequently, the quality of a product depends on the process by which the product is designed and produced. Likewise, the quality of information depends on the design and production processes involved in generating the information. One of the local study on information quality investigated by Zailani and Rajagopal (2006), found that the extent of information quality is positively increased the supply chain performance. This study, however, believed that there is a gap in the literature about dimensions for information quality in the context of buyer-supplier relationships in supply chain management. Based on this gap in the literature, a detailed investigation on the dimensions of information quality is therefore necessary. Furthermore, it is interesting to see the importance of

information quality on the supply chain relationships among supplier companies. This study, therefore, investigates the effect of information quality on the supply chain relationships in the context of supplier perspectives in Malaysia.

1.3 Research Questions

This study is primarily undertaken to investigate the dimensions of information quality that are important in influencing the buyer-supplier relationships, and ultimately can increase firms' effectiveness in supply chain management. Based on the problems discussed in the previous section, the research questions of this study are:

1. What are the dimensions of information quality that are significant in the supply chain environment?
2. How do the dimensions of information quality influent the buyers-suppliers relationship?

1.4 Research Objectives

This study is to understand and to see the relationship between the dimensions of information quality in buyer-supplier relationships. Specifically, this study is to:-

1. Investigates the dimensions of information quality that is significant in the supply chain environment.

2. Examines the influence of the dimensions of information quality on the buyers-suppliers relationship.

1.5 Significance of the study

It is important to know the factors that can improve and strengthen the buyer-supplier relationships. It cannot be denied that information quality is important in improving the supply chain systems but there has not been any empirical research looking on its' impact on the buyer-supplier relationships, which this study try to accommodate. Therefore, there is a need for research that establishes linkages between the information quality dimensions and buyer-supplier relationships.

This study will help to understand in managing the quality of the information in establishing quality relationships between the buyer and supplier from the suppliers' perspective. The study is also expected to contribute to the theory by investigating the dimensions for information quality in the supply chain environment and their influence on the buyer-supplier relationships. Furthermore, this study is expected to be important to the practical as it reduces risk in supply chain relationships by providing tools for planning and analysis in terms of information quality.

1.6 Scope of Study

This study, however, will investigates the dimensions that commonly identified as information quality dimensions in the literature review and also commonly believed to be the most significant for the supply chain management environment. Furthermore, the study is only focused from the supplier's perspectives and due to time constraints only the suppliers from ten of the multinational company in the northern region have been selected as the respondents (will be further discussed in Chapter 2 and Chapter 3).

1.7 Definition of Terms

To clarify the language of this study, the following definitions have been chosen:

1.7.1 Information

Information is the result of processing, manipulating and organizing data in a way that adds to the knowledge of the person receiving it. In other words, it is the context in which data is taken. Information as a concept bears a diversity of meanings, from everyday usage to technical settings. Generally speaking, the concept of information is closely related to notions of constraint, communication, control, data, form, instruction, knowledge, meaning, mental stimulus, pattern, perception, and representation (http://en.wikipedia.org/wiki/Information).

1.7.2 Quality

One of the most succinct is simply that quality is fitness for purpose, or in other words; it is simplified as the output matches the specification or requirements of the putative user (Juran, 1985). It thus becomes possible to speak of a "quality" of kilometrico pen as well as a "quality" Parker pen. The issue is not where the pen fits on some hypothetical scale of reliability or comfort, but whether it meets the reasonable expectations of the user and is built in accordance with a set of criteria known to both producer and consumer.

1.7.3 Information Quality (IQ)

Information Quality is a term to describe the quality of the content of information systems. Most information system practitioners use the term synonymously with data quality. However, as many academics make a distinction between data and information, some will insist on a distinction between data quality and information quality. Information quality assurance is confidence that particular information meets some context specific quality requirements. "Information quality" is a measure of the value which the information provides to the user of that information (Wang & Strong, 2006).

1.7.4 Information Quality Dimensions

Although there are no uniformed lists for the information quality dimensions, the most commonly identified information quality dimensions addressed in the literature are by

Ballou et al., (1987) which are focused on accuracy, which occurs when the recorded value is in conformity with the actual value; timeliness, which occurs when the recorded value is not out-of-date; completeness, which occurs when all values for a certain variable are recorded; and consistency, which occurs when the representation of the data values is the same in all cases.

1.7.5 Buyer

Buyer or customer is someone who makes use of or receives the products or services of an individual or organization. The word historically derives from "custom," meaning "habit"; a customer was someone who frequented a particular shop, who made it a habit to purchase goods of the sort the shop sold there rather than elsewhere, and with whom the shopkeeper had to maintain a relationship to keep his or her "custom," meaning expected purchases in the future. The shopkeeper remembered the sizes and preferences of his or her customers, for example. The word did not refer to those who purchased things at a fair or bazaar, or from a street vendor. Customers can be classified into two main groups: internal and external. Internal customers work for the organization, possibly in another department or another branch. External customers are essentially the public (http://www.answers.com/topic/customer).

1.7.6 Supplier

In this contact the supplier is the one who is responsible to supply the product as per the buyer request or in other words, a company which supplies parts or services to another company, also called vendor. Supplier relationship is a comprehensive approach to managing an enterprise's interactions with the organizations that supply the goods and services it uses. The goal of supplier relationship is to streamline and make more effective the processes between an enterprise and its suppliers (http://www.answers.com/topic/supplier).

1.7.7 Relationship

State involving mutual dealings between people or parties or organizations (http://www.thefreedictionary.com).

1.7.8 Buyer- Supplier Relationship

Buyer-supplier relationships have been considered in terms of their key defining constructs, performance outcomes, antecedents and development process (Dwyer et al, 1987). In this research, the relationship constructs studied include; trust, adaptation, communication, satisfaction, commitment, cooperation and dependence.

- **Trust** can be defined as an assurance that each party is reliable and consequently fulfils their obligations associated with the relationship (Wren and Simpson, 1996).

- Morgan and Hunt (1994) define relationship **commitment** as "an exchange partner believing that an ongoing relationship with another is as important as to warrant maximum efforts at maintaining it...to ensure that it endures indefinitely".

- **Cooperation** can be defined as "the process by which...organizations interact...for mutual gain and benefit" (Smith, Carroll and Ashford, 1995).

- **Dependence** is a central defining construct of the buyer-supplier relationship (Hogarth-Scott and Parkinson, 1993).

- **Adaptation** occurs when supplier adapts to the needs of specific important customers and that customers adapt that capabilities of specific suppliers (Helen et al., 1991).

- **Satisfaction** is the positive feeling that results from an evaluation of all aspects of an exchange relationship (Wilson & Kristan Moller, 1991).

- **Communication** has been defined as "the formal as well as informal sharing of meaningful and timely information between firms" (Anderson & Narus, 1990).

1.8 Thesis Structure

This research consists of five chapters. The details of the following chapters are as below:

a) Chapter One – This chapter provided an overview of introduction, background, problem statement, research objectives, scope and significance of this study and the definition of the key terms.

b) Chapter Two - This chapter discussed on the Literature Review of the variables. This chapter will also highlight the previous research and findings from other researchers.

c) Chapter Three - This chapter elaborate on how the study is conducted which is about the methodology of the research. This covered the sample populations, designs, instruments and statistical analysis that will be used.

d) Chapter Four - This chapter covered the findings and results from the analysis

e) Chapter Five - This is the final chapter which presents the discussions, conclusions and implications of the research. It will also propose for future research to be conducted.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter presents a detailed review of work reported in the literature on information quality and buyer supplier relationship. Reviews of these and related literature are then discussed, followed by an evaluation of selected studies across the world. Before a framework of the study is presented, the dimensions of information quality and constructs of buyer supplier relationship are discussed. The strength of the literature produced by previous researches will be discussed and this will lead to the development of the theoretical framework and generation of hypotheses at the end of the chapter.

2.1 Definition of Quality

During the 1980s and '90s, when Total Quality Management (TQM) was all the rage, many and various definitions of quality were put forward. One of the most succinct is simply that quality is fitness for purpose, or in other words; it is simplified as the output matches the specification or requirements of the putative user (Juran, 1985). It thus becomes possible to speak of a "quality" of kilometrico pen as well as a "quality" Parker pen. The issue is not where the pen fits on some hypothetical scale of reliability or comfort, but whether it meets the reasonable expectations of the user and is built in

accordance with a set of criteria known to both producer and consumer. In information terms, this means that information items geared towards one set of consumers may be perceived as poor quality when located by a different set. Problems start when it becomes difficult to discern the intended user of a piece of information, or when users expecting one quality level encounter information built to a different quality level (Ballou et al., 1987).

2.2 Information Quality

Based on discussions in the previous section, good product quality means the product fulfills its requirements. In the beginning of quality management discipline, the concept of quality was only applicable to products. There are huge studies on the quality but more focused on the product development studies which have explored on the importance, strategies, tools and benefits such as quality control, quality awards, and statistical methods like Six Sigma and ISO 9000 standards (Huarng & Chen, 2002). However, present discussions include quality of information. Since modern companies are information factories (Chandy et al, 2003), their key competence is information management. Chandy et al (2003) illustrated an example of automobile factory for this statement. The factory takes raw materials such as steel and glass as inputs and creates value by transforming them into cars; an enterprise computing system can take raw events generated by myriad sources as inputs and create value by transforming them into more structured information.

Therefore, developing information management skills and information quality is essential to their business. This is due to the fact that the information quality is a measure of the value which the information provides to the user of that information, in this case is the organizations' businesses (Wang & Strong, 2006). According to Gelle and Garhu (2003), providing better tools to manage information in organizations is an essential part of quality management in information factories. Furthermore, they have suggested that to provide good quality information for business strategy in a company, they need to: define the users' needs; plan and specify how information technology helps to fulfill customers' needs; implement methods and tools that conform to specifications; check how implementation fulfills customers' needs; plan how data quality can continuously be improved; implement small improvements.

Information or sometimes called as data quality, however, typically conceptualized as a multi-dimensional concept. Figure 2.1.1 depicts Wang and Strong's (1996) model of information quality as a multi-dimensional construct. According to them, although the exact number of dimensions considered and the arrangement of the dimensions varies somewhat from researcher to researcher, the essence of this model now has broad support among the information quality research community (refer to Figure 1).

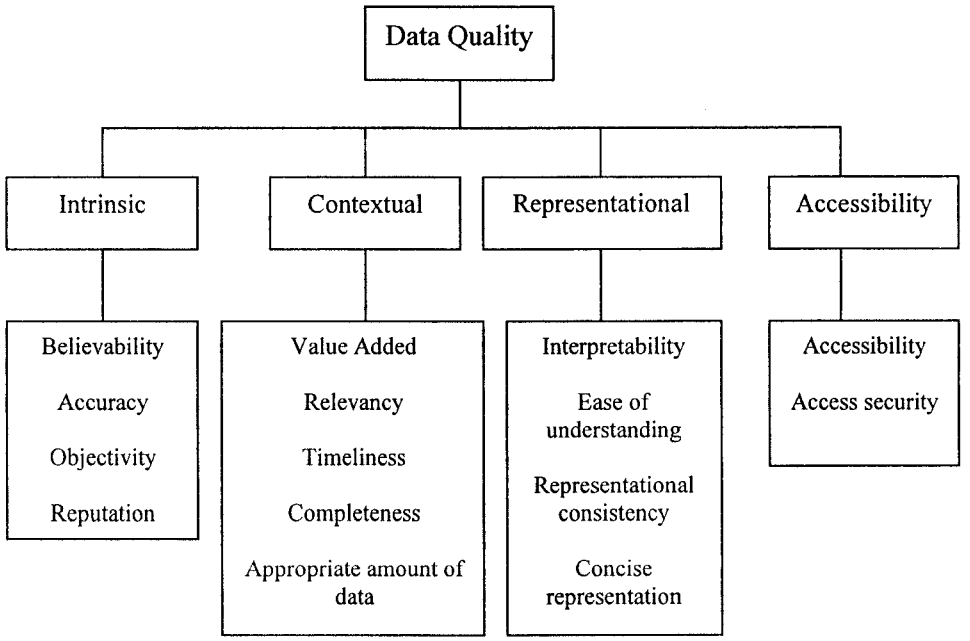

Figure 2.1. Information quality as a multi-dimensional construct

Note. Adapted from Wang, R. Y., and Strong, D. M. (1996).Beyond accuracy: What quality means to data consumers. Journal of Management Information Systems, 12(4), 5-34.

Awareness of information quality as an issue emerged slowly during the early years of computers, when researchers gradually developed an awareness of the need to measure data quality, and began the work of convincing others of that need. Information quality is a term to describe the quality of the content of information systems. As mentioned earlier, most information system practitioners use the term synonymously with data quality. However, according to Wang and Strong (1996), as many academics make a distinction between data and information, some will insist on a distinction between data quality and information quality. Information quality assurance is confidence that particular information meets some context specific quality requirements. In conjunction with Wong and Strong's model, Davis and Olson (1985) have identified three aspects of data quality: accuracy, precision, and completeness. Looking at other perspectives, information quality

also can be defined in terms of accuracy, completeness, consistency, and currency (Huh et al, 1990). Fox et al (1993) also identified the same four dimensions of information quality as Huh et al, (1990) which are accuracy, completeness, consistency, and currency.

In contrast to this conceptual framework, Madnick and Wang (1992) presented definitions of information quality derived from empirical observation. Zmud (1978) used factor analysis to examine the dimensionality of the construct of information. Four dimensions were derived: quality of information, relevancy of information, quality of format, and quality of meaning, in which, they used observations of defective information in organizational databases to derive four components of information quality: completeness, accuracy, appropriateness, and consistency. Wand and Wang (1996), on the other hand, argued for a definition of information quality, should be focused on task-independent, in which, he has identified four dimensions of intrinsic information quality which are: completeness, lack of ambiguity, meaningfulness, and correctness. These dimensions are said to be applicable across different applications applied to different tasks. In summary, Table 2.1 lists a comprehensive set of information quality criteria that are taken from Naumann and Rolker (2000).

Table 2.2
Information Quality Criteria

1. Availability - Percentage of time an information source is ''up''. Also: accessibility, reliability, irretrievability, performance

2. Accuracy - Quotient of the number of correct values in the source and the overall number of values in the source. Also: error rate, correctness, integrity, precision
3. Amount of data - Size of result. Also: essentialness
4. Believability - Degree to which the information is accepted as correct. Also: error rate, credibility, trustworthiness
5. Completeness - Quotient of the number of response items and the number of real world items. Also: coverage, scope, granularity, comprehensiveness, density, extent
6. Concise representation - Degree to which the structure of the information matches the information itself. Also: attribute granularity, occurrence identifiably, structural consistency, appropriateness, format precision
7. Consistent representation - Degree to which the structure of the information conforms to that of other sources. Also: integrity, homogeneity, semantic consistency, value consistency, portability, compatibility
8. Customer support - Amount and usefulness of online support through text, email, phone etc.
9. Documentation - Amount and usefulness of documents with meta information. Also: traceability
10. Interpretability - Degree to which the information conforms to technical ability of the consumer. Also: clarity of definition, simplicity
11. Latency - Amount of time. Also: response time
12. Objectivity - Degree to which information is unbiased and impartial.
13. Price - Monetary charge per query. Also: cost-effectively

14. Relevancy - Degree to which information satisfies the users need. Also: domain precision, minimum redundancy, applicability, helpfulness
15. Reliability - Degree to which the user can trust the information. Note: *technical* reliability is synonymous to *availability*.
16. Reputation - Degree to which the information or its source is in high standing. Also: credibility
17. Response time - Amount of time until complete response reaches the user. Also: performance, turnaround time
18. Security - Degree to which information is passed privately from user to information source and back. Also: privacy, access security
19. Timeliness - Age of information. Also: up-to-date, freshness, correctness
20. Understandability - Degree to which the information can be comprehended by the user Also: ease of understanding
21. Value - Added Amount of benefit the use of the information provides.
22. Verifiability - Degree and ease with which the information can be checked for correctness. Also: naturalness, traceability, provability

Although there are no uniformed lists for the information quality dimensions, this study adopts the dimensions that commonly identified as information quality dimensions in the literature review and also commonly believed to be the most significant for the supply chain management environment. They are accessibility, appropriate amount, believability, completeness, concise representation, consistent representation, ease of

operations, free of error, interpretability, objectivity, relevancy, reputation, security, timeliness, understandability and value added (refer to Table 2.1 for definitions).

2.1.1 Measuring Information Quality

The ability to measure anything is essential to one's ability to manage it. The same is true for information quality. In 2002, Lee et al. observed that "despite a decade of research and practice, only piece-meal, ad hoc techniques are available for measuring, analyzing, and improving IQ in organizations". In response to this situation they developed a measurement instrument, known as the Information Quality Assessment (IQA), which measures stakeholder perceptions of each dimension in the Wang and Strong (1996) model. This instrument, which employs 69 items to measure the various information quality dimensions, has been used as the basis of several studies requiring information quality measurement (Kahn et al., 2002; Pipino et al. 2005) as well as for studies that extend this measurement concept further, such as the PSP/IQ model (Kahn et al., 2002). The PSP/IQ model aggregates the results of the 69 items and 16 dimensions measured by the IQA to produce a measure of information quality consisting of only four numbers. By using the IQA to measure the dimensions, the quadrant measurements are derived by calculating the mean scores for the dimensions associated with each quadrant (Kahn et al., 2002; Lee et al., 2002).

Despite the quantitative nature of the measurements in the previous section, these measurements are subjective, based on human perceptions and subject to the human

interpretation of the state of information quality and the meaning of the questions asked. Wand and Wang (1996) used an ontological perspective to develop rigorous definitions of the dimensions. Drawing on communication theory and information economics, they adopted the fundamental notion that "the information system is to provide a representation of an application domain (also termed the real-world system) as perceived by the user". Based on this notion, they developed a formal definition of an information system and its ideal state as a correct representation of the real-world system. Information quality problems thus manifest themselves as one of four types of deficiency: incomplete representation, ambiguous representation, meaningless states, and incorrect states. Each of these is defined precisely and formally in terms of a mapping from the real-world system to the information system and back. Information quality dimensions (or their negative counterparts) are defined in terms of represented states and deficiencies. For example, an information system is inaccurate if it "represents a real world state different from the one that should have been represented". Similarly, inconsistency is a state in which "the representation mapping is one to many".

Although such formal definitions have been developed, the ability to operate measurements for some information quality dimensions continues to be problematic for researchers. This is supported by Redman (2005) for dimension of accuracy. As Redman (2005) put it, "there is nothing akin to length, viscosity, impurities in parts per million, impedance, or other physical dimensions". He went on to note that "all measurements of data accuracy must, of necessity, make reference to human knowledge, other data, or the real world". Redman (2005) also proposed a four-component framework for measuring