



UNIVERSITY OF GOTHENBURG

Framework for Measuring Perceived Quality in Technical Documentation

Bachelor of Science Thesis in Software Engineering and Management

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Göteborg, Sweden, February 2013

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Abstract

Customer product information (CPI) provides essential information to a user about how to use a product. Given the importance of such technical documentation to enable a more effective use of technology, there is very little research conducted in the domain of improving document quality. This study intends to fill this gap by developing a tentative framework for how to measure user perceived quality (PQ) of technical documentation. Data collection is based on a literature review and interviews with practitioners. The advantages and disadvantages of the approach are evaluated and suggestions for future studies outlined. The implication of this research is that it allows companies that produce technical documentation to measure and thus improve document quality more effectively.

Keywords: *benchmarking, checklists, data quality, key performance indicators, perceived quality, performance measurement, surveys and user satisfaction.*

1 INTRODUCTION

In today's globalized business market organizations are increasingly striving to adopt a more customer-focused approach to remain competitive. This is deemed as important to improve the quality of products and services. Companies within the information system (IS) sector, especially those who specialize in technical documentation are increasingly recognizing the importance of measuring quality more effectively to stay competitive. The quality of technical documents and user manuals form an important part of perceived product quality. Generally, users turn to product documentation in order to learn more about the product (Wingkvist, et al., 2010).

Thus, technical documents quality plays a pivotal role both for the usability of the document itself and the product. In simple language, in order to achieve satisfaction of customer requirements, a product must do what the customer expects it to do. From this perspective, the ability to initially measure and eventually control customer perceived quality, is a major success factor in software business (Xenos & Christodoulakis, 1997).

In the software engineering field the customer is assumed to have a central role in improving internal activities and thus quality of products and services (Fogelström, et al., 2009). To achieve this there needs to be a close fit between stated requirements and the product itself. From this perspective, the interaction between the user and the enterprise is important to improve the overall quality of products and services.

The idea of increased customer collaboration can be applied for improving the development of technical documentation as data coming from user's feedback is essential to improve document quality. However, this requires a systematic approach for measuring the perceived quality in such products.

The Swedish company Sigma Kudos develops one type of technical document labeled *customer product information* (CPI). In brief, the CPI contains all relevant information for how to use a product or system. In practice, the CPI supports the user in terms of how to use complex systems like serving GPRS support node-mobility management entity (SGSN-MME). The system handles the registration of the mobile to the GPRS network and takes care of its mobility management. Sigma Kudos intends to develop a more rigorous approach to measuring quality in their technical documentation, with a special focus on CPI.

1.1 Research aim

The aim of this study is to develop a tentative framework for how to measure the perceived quality of technical documentation by using the pre-defined key performance indicators (KPIs) (see Table 1). The KPIs have been developed in a recent study Amanpreet (in press) and Sigma Kudos specifically for technical documents. According to this study the KPIs are created by focusing on quality attributes of the document and they can be used during the performance measurement process. Table 1



displays the KPIs suitable for measurement of CPI documents quality:

KPI	Quality Attributes
Structure	Understandable, well-presented, well-documented, concise representation, representation consistency, interpretability
Contextual	Value-added, appropriate amount of data, relevance, completeness
Accuracy	Accuracy, believability, objectivity
Accessibility	Accessibility, easily traced, user friendly, ease to retrieval

Table 1: KPIs for documents source (Amanpreet, in press).

Current research shows that while there is much written about quality improvement in products and services, there is none that specifically focus on document quality. Additionally, there is little guidance as to the practice of measuring perceived quality in documents. The current study is an attempt to address this shortcoming by providing some useful insights into the basic components of measuring perceived quality in technical documents. In view of this, the guiding research question for the study is: How can perceive quality be measured in technical documentation? Thus, this is the impetus for this investigation and resulting tentative framework.

To accomplish the research objective a qualitative research design is used in a two-pronged approach: 1) a literature search and review to map out the current knowledge of performance measurement and 2) interviews with Sigma Kudos staff to capture practitioners view on document quality. The outcome from the data collection is summarized and presented in the tentative performance measurement framework on page 10.

1.2 Delimitation

The study focuses mainly on developing a tentative measurement approach for perceived quality of technical documents. Due to time and access constraints it is also outside the scope of the study to test the resulting framework into a real-world setting. Instead the study

discusses the advantages and disadvantages of the framework and its usefulness in various contexts.

1.3 Overview

The rest of this paper is outlined as follows: section 2 provides an overview of related research as well as summarizing the literature into a tentative framework for the case. Section 3 describes the research approach and process. Then, findings are presented in section 4. Finally, in section 5 the findings are discussed and suggestions for future work are outlined in section 6. The paper ends with conclusion section.

2 RELATED RESEARCH

This section reviews the literature on perceived quality, surveys, data quality and performance measurement with the view to develop a tentative framework for measuring quality in documents.

Wingkvist, et al. (2010) state that in order to determine the quality of a product metrics need to be defined, weighted and many of these metrics are based on checklists. Checklist is a valid technique for evaluating software product quality. Further, it is suggested to be an “outstanding instrument” for handling the problem of measurement procedure for qualitative determination (Punter, 1997). For example, it allows choosing suitable indicators and measures which determine a quality characteristic.

According to Xenos & Christodoulakis (1995) an approach is required for the measurement and evaluation of users’ opinion. The purpose of this is to evaluate the user’s opinion with respect to computers in general and to use this information to improve software quality.

They suggest that the most efficient way to collect user’s opinion is devising and performing structured questionnaires and surveys (Xenos & Christodoulakis, 1995, 1997). This perspective can be transferred to improving quality of documents and is thus also beneficial for developing a viable measurement process for such products.



2.1 Perceived quality

According to Wingkvist, et al. (2010) the notion of quality is most often viewed as an “intangible trait, something that can be subjectively felt or judged, but often not exactly measured or weighted”. They argue that terms like good or bad quality are deliberately vague and used with no intention of ever being an exact science. This certainly creates confusion as with respect to defining the concept of quality.

Aaker (1991) states that perceived quality (PQ) is the customer’s perception of the overall quality of the product with respect to its intended purpose. PQ can be associated with price premiums, brand usage and stock return. Further, it has the important attribute of being applicable across product classes.

In order to elicit and understand user PQ both user satisfaction and all functions of a business need to be linked. Xenos & Christodoulakis (1997) further state that the ability to initially measure and control customer PQ is a fundamental factor in software business, therefore an approach is needed to systematically measure this. The approach includes continuous involvement of the customer into company’s business activities.

Fogelström, et al. (2009) argues that cooperation between user and organization is a prerequisite for improving product quality. Measurement of PQ about the product requires the identification of quality attributes (QA) of the product.

According to Xenos & Christodoulakis (1995) the following QA sufficiently describe all the aspects of the user’s critique regarding a product:

- Efficiency
- Expandability
- Functionality
- Maintainability
- Portability
- Reliability
- Simplicity
- Usability

These attributes are the most commonly used within software engineering to identify quality attributes of a product. There are some empirical studies regarding the

measurement of PQ of software products where the measurement process is performed by applying an approach, which relates internal measureable quantities with external quality attributes. These can be found in the software measurement literature (Masayna, et al., 2007).

For instance, Xenos & Christodoulakis (1997) mention function points which are used for estimating product cost. Further, they suggest that cyclomatic complexity is used for estimation of software complexity. This one is software metric and measures the number of linearly independent paths through a program’s source code. Also, that effort estimator could be used to identify required effort (Xenos & Christodoulakis, 1997).

2.2 Surveys

Surveys are capable of obtaining information from a large population. Furthermore, surveys can also elicit information about attitudes that are otherwise difficult to capture using observational techniques (Glasow, 2005).

Electronic surveys are a good example of how user opinions can be gathered efficiently. However, surveys are not unproblematic. The problems associated with surveys have been raised in many studies and include (Xenos & Christodoulakis, 1997):

- Subjectivity of measurements.
- Difficulty of statistically analyzing results.
- Lack of a weighing technique.
- Frequency of errors.

According to Xenos & Christodoulakis (1997) these issues produce unreliable data and therefore decrease the quality of the outcomes. In addition, they also point to the fact that undesired results are often related to the participants. In other words, respondents are hard to control and prone to mistakes. For instance, they answer the questions subjectively; sometimes they are not the ‘right’ people for answering the questionnaires and fail to answer the questions properly by giving unexpected answers (Xenos & Christodoulakis, 1995).

This demonstrates that although there is a clear goal for what type of data one needs to collect, the results could be difficult to manage or predict. Therefore, well-planned and structured surveys are required in order to avoid problems.



2.2.1 Handling the problems

Subjectivity of measurements Xenos & Christodoulakis (1997) argue that subjective judgments bring in a degree of error. In their view, subjectivity of measurement will remain a problem, regardless of the measurement methodology.

However, according to Lahlou, et al. (1992) the application of a number of simple rules when designing the questionnaire can improve the quality of the measurement. They propose the following guideline for structuring a questionnaire (Lahlou, et al., 1992):

- Describe the aim of the questionnaire and relate the first question with this aim.
- The questionnaire should be attractive to the user and the size must be kept short.
- The questionnaire should be well structured and the questions have to follow a logical order without referring to each other.
- Avoid open question if it is possible.
- Questions should be objective to avoid affecting user judgment.
- Avoid to use confusing concepts such as probability.

The quality manager should apply the above mentioned guidelines in order to decrease error relate to human judgment (Xenos & Christodoulakis, 1995, 1997).

Scale types statistical analysis refers to a collection of methods used to process large amount of data. According to Xenos & Christodoulakis (1997) statistical analysis has a vital role in quality improvement activities because it provides ways to objectively report the status of the product based on data collection. Further, it is particularly useful when dealing with complex data coming from different sources.

There are four standard measurement scales to use as a basis for developing a survey. Which one to apply depends on the type of information contained in the measurement results, so addressing the most suitable one

is crucial and enhances the success of measurement analysis (Xenos & Christodoulakis, 1995, 1997).

- **Interval scale.** Quantitative attributes are all measurable on interval scales. It is about the order of data points, and the size of the intervals in between data points (Stevens, 1946).
- **Nominal scale.** Represents the most unrestricted assignment of numerals and used only as labels or type numbers. For instance the use of numerals as names for classes is an example of the assignment of numerals according to rule. The rule is: Do not assign the same numeral to different classes (Stevens, 1946).
- **Ordinal scale.** In this scale type, the numbers assigned to objects or events represent the rank order. An example of ordinal scale is the scale of hardness of mineral. Other instances are found among scales of intelligence or quality of leather (Stevens, 1946).
- **Ratio scale.** Most measurement in the physical sciences and engineering is done on ratio scales. There are two types of ratio scales: *fundamental* and *derived*. Fundamental scales are represented by length, weight and electrical resistance. Derived scales are represented by density, force and elasticity. The scale type takes its name from the fact that measurement is the estimation of the ratio between a magnitude of a continuous quantity and a unit magnitude of the same kind (Stevens, 1946).

One of the main problems with survey measurement is that survey data based on ordinal scale cannot be statistically analyzed using formal statistical methods. For example if the questionnaire has multiple choices, choice bars can be the solution, also an instruction that explains the choices are in interval scale and equal distance to each other should be mentioned (Xenos & Christodoulakis, 1997).

Analysis: Weighing user opinions is important because all users are different and each specific one should be accordingly evaluated (Xenos & Christodoulakis, 1995, 1997). For instance all users are not equal, they not have the same background of knowledge and they do not have



the same needs. An organization should take into consideration all these factors for assessment of measurement process and weighing user opinions based on users' qualification can be a way to increase the quality of the survey.

Xenos & Christodoulakis (1995) visualized a process to evaluate user's knowledge considering three parts, personal background, syntactic knowledge and semantic knowledge. The personal background contributes the half of the rest equally contributing parts here below is the graphic showing the visualization:

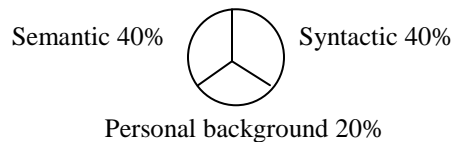


Figure 1: Evaluating user's qualification source Xenos & Christodoulakis (1995).

- Personal background should be a collection of unrelated user qualification in the actual questionnaire area or product.
- Syntactic knowledge general knowledge regarding the area.
- Semantic knowledge how well the user is aware the semantics of the problem caused by the product.

For instance personal background should cover all attributes related to the user such as age and gender; syntactic knowledge should address how familiar the user is with the actual product and semantic knowledge in most of the cases new programs are built in order to substitute the old one the semantic knowledge defines how well the user can handle the issue related to this activity (Xenos & Christodoulakis, 1995, 1997).

By knowing the user's background the questionnaires can be developed based on different kinds of users and expected outputs could be predetermined. Capturing knowledge level of the user is relevant both for the quality of collected data and the improvement of the product (Masayna, et al., 2007). If the survey is well-designed as well as being addressed to the right people, the overall

then both the predesigned questionnaire and the outcome data of the survey will be of higher quality.

Preventing errors surveys are really sensitive to errors because humans do not like filling questionnaires, especially when the questions have to do with their abilities. Therefore they never take this task seriously (Xenos & Christodoulakis, 1995).

According to Xenos & Christodoulakis (1997) in their surveys they have measured a significant number of errors that will occur when the user responses the questions incorrectly such reasons are:

- The user did not answer the questionnaire himself/herself, but give it to someone else who was inadequate to respond.
- The user answered the questionnaire very carelessly and marked randomly when he/she was confused.
- The user started to answer the questionnaire with enthusiasm and lost interest somewhere in the middle of the questionnaire.

Such errors can be prevented by following the simple rules presented in this research paper, but cannot be eliminated. Due, it is difficult to design questionnaires that will detect the errors, the literature introduces the techniques that can help to show the presents of these errors and cannot ensure the absence. Techniques presented in the following section, are used in order to detect such errors (Xenos & Christodoulakis, 1995, 1997).

The techniques the main aim of this study is to present a rigorous approach to perceived document quality measurements that will help a quality manager to include such measurements in the company's quality assessment program. According to Xenos & Christodoulakis (1995, 1997) this is done by using structured surveys to produce measurement results with a minimum degree of subjectivity, easy to analyze, respecting user qualification and as error-free as possible.

The techniques proposed in order to measure the users' perception of document quality are (Xenos & Christodoulakis, 1995, 1997):



- 1- Qualification weighed user opinion (QVCO) this one is less expensive and reliable.
- 2- Qualification weighed user opinion with safeguard (QVCO~s) this one is both more reliable and expensive, than the first one.
- 3- Qualification weighed user opinion with double safeguard (QVCO~ds) this one is the most expensive and reliable.

These techniques are used by applying a formula and each specific technique has own formula (Xenos & Christodoulakis, 1997).

- QVCO this one measures the score of user opinion, qualification and the number of interviewed.
- QVCO~s in this one safeguard is used in order to handle errors, where safeguard is defined as a question embedded in the questionnaire and checks if the user is responding correctly.
- QVCO~ds this one will use double safeguard it checks both errors in user opinions and qualification.

In order to measure user qualification the safeguard questions inside the questionnaire should include information covering the aspects of qualification (Xenos & Christodoulakis, 1995, 1997). Control questions or repeated questions can be used as safeguard in order to check if the user is the one addressed to the questionnaire, where control question can be answered by one specific response. Also, repeated questions offering different response placed not close to each other can be used for checking errors.

Paying attention to previous mentioned aspects in order to measure the quality of a document by conducting surveys regarding user satisfaction can provide significant information about the status, condition and attitudes of users after they have received the document. Further, if the survey technique is applied accordingly, the data obtained on user experiences and satisfaction is more likely to be credible (Hatry, 1999).

2.3 Data quality

It is difficult to give a universal definition of what quality means and it depends on several aspects. Therefore, in order to obtain an accurate measure of the quality of data, one has to choose which attributes to consider and how much each one contributes to the quality as a whole (Bobrowski, et al., 1998). Wang, et al. (1995) emphasize that it is hard to manage data quality (DQ) without understanding the attributes of the data, which defines its quality. They identify the following attributes as the most important:

- Accuracy is defined as *“The recorded value is in conformity with the actual value.”*
- Completeness is defined as *“All values for a certain variables are recorded.”*
- Consistency is defined as *“The representation of the data value is the same in all cases.”*

From this perspective it is clear that data quality is a multidimensional and hierarchical concept, where accuracy is the most obvious dimension when it comes to DQ (Wang, et al., 1995). One could argue that these attributes are also valid for measuring quality of CPI document. Inaccurate or incomplete data can have significant impacts on the success of business activities of the enterprise, but there is a cost-quality tradeoff in implementing data quality programs. For instance, when the cost is extremely high zero-defect data is not possible to sustain.

According to Jones (1991) the data coming from questionnaires can be divided in two categories: soft data measurement and hard data measurement. Soft data are related to areas in which human opinion must be evaluated and absolute precision cannot be achieved. For the hard data elements high accuracy is both possible and desirable.

Data quality has been a significant issue for the business of the companies where organizations are aware about the importance of the data and the cost to sustain in order to deliver a good data quality (Masayna, et al., 2007). Moreover, data need to be accessible, useful, comprehensible and believable to the user the goal is to facilitate the collection and the processing of data.



So, DQ should satisfy a given set of quality requirements. For instance, the improvement of data requires a significant amount of resources and time where poor data implies higher cost and time consuming. Furthermore, the company has to go through data several times in order to make improvements, spend more time by repeating the process and make changes if it is necessary (Wang, et al., 1995). Therefore, a measurement process is required in order to objectively track actual performance against planned objectives, to help assess overall business and technical performance against market-driven requirements.

2.3.1 Linking DQ to KPIs

It is important to understand the link between DQ and KPIs because they are interdependent (Masayna, et al., 2007). Further, there is a need to examine way of improving DQ so that KPIs better address the goals established for them. Figure 2 demonstrates the link between DQ and KPIs where DQ is linked to organizational KPIs which can enable better decision-making with regards to organizational investment in DQ efforts.

According to Masayna, et al. (2007) the model visualized below is helpful, because it focuses on improving DQ so KPIs can effectively support management objectives. The model is related to research reports regarding the current state of DQ initiatives in Australian organizations.

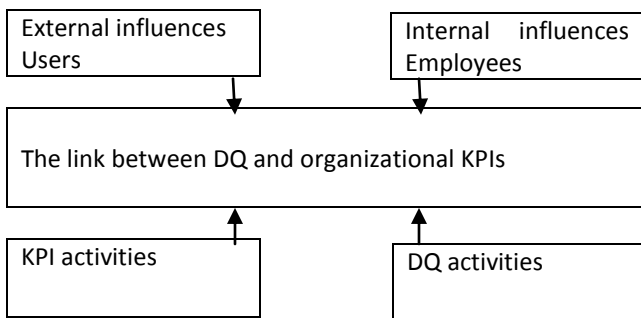


Figure 2: Linking DQ to KPIs source Masayna, et al. (2007).

However, in order to fully appreciate the relationship between DQ and KPIs they should be light of user

activities. Today the knowledge regarding the link between DQ and companies KPIs is still unclear. In light, of this an enterprise should be able to identify the data quality elements which are relevant to support the KPIs (Arayici, et al., 2009). The next section defines KPIs in more detail.

2.3.2 Measuring key performance indicators

Masayna, et al. (2007) defines key performance indicators (KPIs) as measures that determine how well business processes are performing in terms of their potential to enable a specific target to be achieved. Ideally, KPIs should be created in relation to a measurable business objective. They can focus on critical parts of organizational activities that need to be improved.

From this perspective, KPIs need to be well defined and linked to particular outcomes. In addition, KPIs reflect the idea that some aspects of organizational performance are more important than others (Vial & Prior, 2003).

The construction industry has so far been the most avid user of KPIs to improve business performance in terms of delivering better end products (Arayici, et al., 2009).

While there are many categories of KPIs, this research will only focus on qualitative ones including: *structured perceptions or structured feedback* where the measurement focuses on user satisfaction of the product. Before starting the creation of the KPI following questions need to be addressed (Masayna, et al., 2007):

- Does the KPI motivate the right behavior?
- Is the KPI measurable?
- Is the measurement cost effective?
- Is the target value attainable?
- Are the factors affecting the KPI controllable?
- Is the KPI meaningful?

Performance measurement (PM) enables businesses to meet demands more effectively where a KPI is created for the business objective, then it is quantified and measured. The main challenges and limitations of applying KPI procedures into enterprise business activities generally include support from the organization and top management commitment.



2.4 Performance measurement

Lichiello & Turnock (1997) defines performance measurement as the regular collection and reporting of data to track work produced and results achieved. There are some basic components of performance measurement. These components are keys to developing an effective, user centered and trusted performance measurement process and include (Lichiello & Turnock, 1997):

- Incorporating stakeholder input.
- Promoting top leadership support.
- Creating a mission, long-term goals and objectives.
- Formulating short-term goals.
- Devising a simple, manageable approach.
- Providing technical assistance.

Performance measurement should be a multidirectional process, running top-down, bottom-up and horizontally within and across the organization where continuous stakeholder involvement and continuous communication forms the basis for improvement (Lichiello & Turnock, 1997). Therefore, only defining a set of KPIs and collecting data is not enough. Performance measurement initiatives need to be supported by a performance assessment and a strong commitment from leaders in order to move toward PM (Masayna, et al., 2007).

Antolic (2008) states that a successful software enterprise implements measurement in order to provide objective information necessary for the decisions that positively impact the business. So, a PM culture helps the project manager to perform a better job, implement more realistic plans and accurately monitor progress against those plans.

Nazemi & Tarokh (2006) emphasize that an enterprise should establish a process for both analyzing and reporting performance data as well as a process for using performance information to drive improvements forward. Furthermore, Nazemi & Tarokh (2006) state that a successful performance measurement should be based on the following principles:

- 1- Measure only what is important.
- 2- Focus on user's needs.
- 3- Keep integrated measurement approach in mind.
- 4- Involve employees in the implementation of the PM process.

3 RESEARCH APPROACH

This section describes the research approach and process adopted to fulfill the goal of this study.

3.1 Research setting

Sigma-Kudos, established in 2007, is an international company with a focus on developing technical documentation. It has offices in Sweden, Finland, Hungary, Ukraine and China. Sigma-Kudos currently employs over 400 specialists within the field of technical and product documentation and related services such as embedded design and information management. The research was conducted in the Gothenburg office, which greatly facilitated the empirical data collection.

3.1.1 Method

In order to get deeper insights into a phenomenon a qualitative research approach is the most suitable to apply (Creswell, 2009). In view of this, the present research was designed as a qualitative inquiry, carried out in two phases:

- The first phase was based on data gathering by conducting a literature review.
- The second phase included conducting interviews.

Thus, the resulting framework is a synthesis from two different sources of data making the study robust.

3.2 Data collection

This part describes the two phases and how it was conducted.

3.2.1 Literature review

Initially, articles, books and journals were reviewed in order to get a better understanding of the literature in the area of measuring the perceived quality of technical documents. The identified key words for this study included: *benchmarking, checklists, data quality, key performance indicators, perceived quality, performance measurement, surveys and user satisfaction*. These key words were used to identify the main area of research, as



well as bringing clarity to the existing knowledge within performance measurement of technical documentation (Sorensen, 2005).

3.2.2 Interviews

Semi-structured interviews were carried out to collect various perspectives of the CPI and to get to the core of perceived problems. The interview guide was designed to capture the perspectives of the specialists employed by Sigma-Kudos. The outcomes of the interviews were written down as notes which then formed the basis for the analysis. In order to make the interview process as effective as possible the following steps were taken into consideration (Creswell, 2009):

- Ensuring that the participants felt comfortable.
- Assuring that the answers were treated completely anonymously.
- Refraining from using leading questions.

According to Creswell (2009) these principles contribute to enhancing the quality of interview data.

3.2.3 Participants

The interviewees consisted of two technical writers who have relationships with the user and a CPI system manager. The technical writers are continuously interacting with the user of the CPI meaning that they often have a good understanding of their needs and opinions. The CPI system manager usually has a lot of experience and knowledge about CPI. These stakeholders have knowledge regard CPI in general.

3.3 Limitation

The interviews were performed with participants who have direct relationship with the users rather than the users themselves. Even if these stakeholders do understand and know users' concerns, their perspectives cannot fully reflect the user's point of view. While this could potentially affect the validity of the interview data in this study, the interviews with the technical writers are still considered important in terms of *indicating* issues and problems in relation to improving the quality of technical documentation.

4 FINDINGS

This section presents the resulting tentative framework for measuring perceived quality of CPI document.

4.1 Interview outcomes

From the interview data it is clear that there is a need for a more systematic way of measuring perceived quality in documents. As expressed by one of the respondents:

"We have some KPIs. These are used to check the quality of documents but we have never used surveys to measure these KPIs."

Another respondent emphasized that:

"We meet the user continuously and give us relevant feedback regarding the status and quality of CPI."

Further, it is clear that the respondents think that the organization should decide what business strategies to adopt to improve the quality of customer product information.

The main issues regarding document quality as raised by the respondents are:

- Hard to access *"users want to access information quickly because sometimes in their daily work they do not have time enough to access the document."*
- Hard to understand *"users do not have the same level of knowledge or qualification this implies that they need to access the right information based on their needs."*
- Incomplete *"users thought that there is lack of information in the document's content and this affect the use of the document itself."*

This kind of information can be gathered during the conduction of structured-surveys and the data could be useful for measurement of perceived quality in CPI document.



4.2 Tentative framework

Based on the literature review and empirical study it has been possible to develop a tentative framework, which visualizes the main components of performance measurement process (see Figure 3). The framework is the main contribution of this study and all components embraced to it are pivotal for the conduction of measurement process.

A description of the main components is as follows:

- **KPI.** Need to be well defined and linked to business objectives (Vial & Prior, 2003). They measure the activity goals, which are the actions an organization has to take in order to achieve a successful process performance (Masayna, et al. 2007).
- **Definition.** Rate KPI 1 to 10 scales and conduct statistical analysis where 1 implies the user is totally dissatisfied and 10 means totally satisfied (Xenos & Christodoulakis, 1997).
- **Objective.** Establish the goal of the measurement for instance to check whether the document is well accurate (Masayna, et al. 2007).
- **Type.** Need to be qualitative measurement based on user satisfaction of document quality (Masayna, et al. 2007).The alternative is a quantitative measurement the company need to decide which one to apply for each specific case.
- **Effort.** Establish priority, how important it is this specific measurement compared to others by assigning high, medium or low priority (Masayna, et al. 2007).
- **Approach.** Carry out surveys and questionnaires designed for the user in order to determine how satisfied the user is, understand his/her behavior and gather data for the measurement by applying the 1 to 10 scale above (Xenos & Christodoulakis, 1997 and Masayna, et al., 2007).
- **Analysis frequency.** Decide when a measurement activity has to be performed for

example daily, weekly, monthly, quarterly or yearly(Masayna, et al. 2007). Usually enterprises perform analysis every year or every three months it depends on organization needs.

KPI Name	Accuracy
Purpose	To determine the level of user satisfaction with the accuracy of the CPI document.
Definition	How satisfied the user was with the accuracy of the CPI document using a 1 to 10 scale, where: 10 = totally satisfied. 8 = mostly satisfied. 5/6 = neither satisfied nor dissatisfied. 3 = mostly dissatisfied. 1 = totally dissatisfied.
Objective	To check whether the CPI document is developed accurately.
Type	Qualitative
Effort	High
Assessment Approach	1- Carry out a structured survey to determine how satisfied the user was with the accuracy of the CPI document, using the 1-10 scale above. 2- The user satisfaction-Accuracy is the user's rating out of 10.
Analysis frequency	Quarter

Figure 3: Tentative framework for measurement of KPIs (Masayna, et al. 2007).

More detailed information regarding the application of the framework and the findings will be discussed later into discussion section. These will be discussed in light of the literature review and interviews with the stakeholders, in order to identify needs for further studies.



5 DISCUSSION

This research is concerned with how to measure perceived quality of CPI documents developed by Sigma Kudos. It builds upon a recent study, which focuses on identifying KPIs for measuring document quality. The resulting framework as presented in this study therefore connects the KPIs with an approach of how to measure document quality. There is a gap between what the literature review yields and how the organization applies its quality assurance process. For instance, structured surveys together with KPIs are currently not used to measure perceived quality of CPI documents. In order to adapt an effective measurement approach the KPIs need to be rated 1 to 10 scale and metrics could be based on structured surveys. So, metrics can easily be automated and empirical data is continuously collected.

This study emphasizes the importance of using surveys to collect user data rather than checklists. According to Xenos & Christodoulakis (1995, 1997) structured-surveys allows an organization to collect empirical data necessary for performance measurement and with less degree of errors.

The main contribution of this study is the tentative framework, which is based on a literature review and empirical data. Underpinning this framework is the design of suitable questionnaires for the measurement of CPI document quality. The framework, yet to be tested, is intended to support performance measurement of technical documentation and thus become a potential tool for continuous quality measurement. Further, it needs to adapt so it can fit to different circumstances and contexts for the best practice.

Sigma Kudos could implement the framework into their existing quality assurance activities, though some adaption and adjustment would be needed to make it work. The framework can be used for the collection of empirical data regarding the status of the CPI document. Data could be collected by carrying out structured surveys and this data can be used for the measurement of perceived quality of the document. Due, the approach requires continuous interaction with the users of CPI, in order to measure perceived quality. This indicates the profound importance of deployment strategy in managing users PQ, especially when a user's expectations are high.

5.1 Application of the framework

Measurement is an iterative process where KPIs are refined in order to capture organization business objectives (Antolic, 2008). It is impossible to make decisions and improvements without having data coming from the measurement that aids the organization to take some actions. The tentative framework in this study has been developed in order to support the collection of empirical data coming from user feedback regarding perceived quality of technical documentation. While the framework is designed for CPI document, it can be applied to other items and sectors.

Since, Sigma Kudos develops different kind of technical documents and products the framework could be adapted to each specific item needs and adjusted according to those needs. For instance, the structure and the skeleton of the framework can easily be applied to assessment of quality assurance process, but the design and development of KPIs as well as questionnaires should be related to each specific organization business objective needs. Any company who wants to measure performance should keep in mind the following:

- First, decide what to measure by applying the principles listed by (Nazemi & Tarokh, 2006):
 1. Measure only what is important.
 2. Focus on user's needs.
 3. Keep integrated measurement approach in mind.
 4. Involve employees in the design and implementation of the measurement process.
- Second, KPIs and data should be respectively well defined (Masayna, et al., 2007).
- Third, allow the KPIs to be rated on a 1 and 10 scale. According to Xenos & Christodoulakis (1995, 1997) statistical analysis has a vital role in quality improvement process.
- Fourth, decide the category and the effort. For example category could be qualitative and effort could be how you prioritize low or high effort (Masayna, et al., 2007).



- Fifth, include control questions and safeguards in the questionnaires (Xenos & Christodoulakis, 1995, 1997).
- Finally, conduct structured surveys regarding user satisfaction of document quality (Masayna, et al., 2007).

5.2 Surveys vs checklists

5.2.1 Surveys

Surveys are effective in term of gathering data. In the context of quality management, KPIs are measured through the administration of surveys to continuously measure quality. The rationale behind surveys is that they are designed to capture the users' opinions.

Advantages:

- *User oriented.* User fills in the surveys.
- *Flexible.* Can be used for different purposes.
- *Effective.* Allows for gathering of large amounts of data in very short time.

Disadvantages:

- *Validity.* There is no guarantee that what is intended to be measured is actually measured.

5.2.2 Checklists

According to Punter, (1997) the checklist approach is a good technique for measuring quality, but normally checklists are not used for measuring KPIs. Further, checklist is a technique to manage items during an evaluation.

Punter, (1997) suggests that three subjects should be addressed to provide objective and reproducible evaluations:

- *Determination of the indicators.* Suitable indicators and measures which determine a quality characteristic are chosen.

- *Procedure.* Checklist requires instructions for an evaluator in order to provide reproducible measurements.
- *Judgment.* After having determined the value of indicators the degree of satisfaction about the characteristic of the product has to be established.

Advantages:

- *Easy to control.* Evaluator fills in the checklist appropriately.
- *Easy to use.* It requires minimal effort.

Disadvantages:

- *Less credible.* Compared to surveys.

5.3 Benchmarking

Before starting the collection of data it is good practice to establish how the data will be used. Arayici, et al. (2009) argues that a benchmarking approach should be identified in order to compare different KPIs results and achieve improvements. Benchmarking allows the comparison among different data results and this can be done both with internal outcomes as well as external the target is to reach progress.

Thus, benchmarking can be embedded into the measurement process, as a complementary measurement approach and it is not mandatory not to adopt. Therefore, performance measurement can be conducted with or without applying benchmarking (Antolic, 2008).

According to Hatry (1999) the traditional benchmarking method is based on comparing current performance level to that of previous years and allows any organization that wants to measure performance to make targeted improvement. Furthermore, benchmarking through the use of KPIs helps companies to improve performance, motivate employees by giving measureable goals to achieve and see how the organization measures up to others in the industry.



5.4 *Evaluating the framework*

Nazemi & Tarokh (2006) state that a successful performance measurement should focus on customer's needs and it should be a feedback loop between customer and developer where data or information regarding the product is shared. Also, taking some action is required in order to make improvements. The quality manager should decide how to apply the framework and which technique to use in each specific situation.

The main advantages of the approach are that it fits into almost every quality assurance framework while also offering enhanced collaboration with the users. The main drawback is that it is not tested with documents yet. In addition, there are costs incurred to deploying the techniques in terms of human factors such as subjectivity judgment involved with surveys.

Both advantages respective disadvantages of the framework are as following:

Advantages:

- It is easy to comprehend as a framework.
- It is flexible and can be adapted to different circumstances/contexts.
- It supports the gathering of credible qualitative data.

Disadvantages:

- It has not yet been tested in reality.
- The real benefits can only be shown after the framework has been tested.

5.5 *Validation of the measurement approach*

Although it has not been possible accommodate a full industry validation of the framework, it has been evaluated by one of Sigma Kudos managers. From his point of view the framework is applicable to measuring perceived quality of technical documentation. Further, he embraces the idea of using surveys in order to collect data regarding the current status of CPI document.

There is recognition within Sigma Kudos that to enhance the producer-customer relationship, this requires a method

in order to measure the customer perception of document quality. It is suggested that to evaluate the potentiality of the approach the company could perform measurement activities using both surveys and checklists. They could then compare the outcome of surveys with checklists and see how the quality of CPI changes over time as well as to identify potential issues that can then be investigated in detail.

5.5.1 *Limitation*

The framework presented in this thesis is tentative and therefore it needs to be validated through testing. Specifically, it needs to be implemented in an organization's quality assurance activities and endorsed by management as part of evaluating its effectiveness in practice.

5.5.2 *Issues and challenges*

During the measurement process all elements and factors mentioned in this research should be considered in order to increase the quality of the measurement. Embracing and using together various aspects present in this paper is the key for a successful application of the approach this will may arise some challenges. For example, each specific context is unique and applying the framework to different situations may require particular resource.

Performance measurement needs to be adopted by any kind of business oriented enterprise that wants to measure critical factors related to business activities. However, supporting and applying it a proper way can be a challenge. There are many factors and elements to take into consideration to make it work properly and obtain the desired effects. From this perspective, Sigma kudos could therefore attempt to apply the framework to other types of documents that requires user interaction.

6 SUGGESTED FUTURE RESEARCH

Initially the measurement framework as presented in this study needs to be tested as to evaluate its real potential in terms of enhancing the quality of CPI documents. In other words, Sigma Kudos can start the verification activities by testing and evaluating the potentiality of the framework. For instance by testing the framework it should be possible to discover all issues that can be



related to the application of the framework. This would also benefit the improvement of the KPIs relating to document quality. The next step is to apply the framework to other document types. This is certainly a worthy research avenue to follow.

As for the future of measurement of document quality, more research is needed to validate the findings of this study and investigate how the PQ of documents in general can be measured. Thus, future research should focus on discovering what the best practice for measurement of document quality is.

7 CONCLUSION

The aim of this study has been to develop a tentative framework for how to measure the perceived quality of technical documentation. As there has been little research conducted in this area the study fills an important knowledge gap. Employees working in Sigma Kudos were interviewed in order to capture their views and needs with regards to perceived quality of CPI documents. The data from the interviews along with the results from the literature review formed the basis for developing a tentative framework to measure CPI document quality. The aim of the framework is to find a solution for quality measurement activities that focuses on customer requirements, in controlling measurement results and increasing confidence to both the company and the users. Both the measurement process and the KPIs should continuously be evaluated and improved according to the users' needs. The proposed research contributes to both theoretical and practical knowledge to the field of measuring PQ.

The main implication for industry is centered on the benefits for Sigma Kudos and to support the implementation of a systematic way of measuring the quality of their CPI documents more effectively. The tentative framework is developed for this purpose. It is intended to aid a quality assurance manager to systematically measure the perceived quality of the CPI and validate the potential benefits of it. This way the study has implications beyond the case organization.

In the future more demands on improving document quality will be made, hence there is a need for companies to develop and implement performance measurement

system that are fit for purpose and relevant. A framework for measuring quality is the first step in achieving this.

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APPENDIX

Interview guides

The appendix introduces interview questions which used during the interviews described in this study.

Collection of demographic data

- Name?
- Age?
- Gender?
- Position?

Data collection

- How you define a KPI?
- Why you define a KPI?
- How do you use KPI?
- What do you measure?
- How do you use the outcome of the measurement?
- What is the current state of CPI according to users?
- How the PQ of CPI can be increased according to users?
- When you perform a measurement process?
- Who performs the measurement?



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