

## **Documentation Management Based on ISO for Construction Industries in Developing Countries**

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**Abstract:** Improper document management (DM) can produce poor and erroneous documents and cause major issues, such as claims and disputes, in construction projects. Adopting a proper documentation management system (DMS) will enable the smooth completion of construction projects to overcome such issues. Quality management systems such as the International Standard Organisation (ISO) standards are designed with generic DM requirements. In developed countries, standard project management procedures and manuals are often used to guide such document requirements. However, construction industries in developing countries are still behind in this regard. Hence, this study aimed to explore the current DM requirements in the Sri Lankan construction industry and the reasons for poor DM and provides suggestions for overcoming these problems. A questionnaire was given to a sample of 30 large construction-contracting organisations operating in Sri Lanka, all of which had ISO certification. The findings revealed 40 DM-related construction activities and their needs and uses by the selected companies. Based on the suggestions given by respondents, this study proposes how to implement these activities and develop an appropriate DMS for the construction industry. This research will offer useful implications for developing countries that use similar standards and encounter similar DM issues.

**Keywords:** Documentation management, ISO, Quality management system, Construction industry, Contractors

### **INTRODUCTION**

Documentation management (DM) enables consistent performance when carrying out processes, regardless of the time, location or person. Many researchers have emphasised the importance of producing adequate documentation in construction (for example, see Carmichael and Murray, 2006; Bjork, 2003; Roozbeh, 1995). Proper documentation of a construction project entails maintaining sufficient records that affect the history of the construction process (Levy, 2002). Document-based information is particularly important in dispute resolution proceedings (Roozbeh, 1995) for helping to avoid or resolve claims (Carmichael and Murray, 2006). In addition, conducting design reviews can reduce project costs and contract modifications (Furry, Hicks and Kirby, 1998). Proper documentation further assists in reaching agreements by defining the facts, roles and responsibilities of the work (Darwish, 2007) and can save time and money and increase the overall productivity of construction activities (Amor and Cliff, 2007).

Current practices in construction encounter several problems due to improper or inadequate DM that result in poor documentation. Poor documents may cause a number of negative effects. Alwis (2005) found that errors, omissions and misinterpretations in contract documents are the main reasons for claims and disputes, while Kumaraswamy and Yogeswaran (2003) found that inadequate

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popular in the construction industry, and that these issues could be severe in developing countries. In fact, Zarebidaki, Nikakhtar and Wong (2012) state that it is costly to implement and purchase suitable DMS software and that it is difficult to work with them. Ali (2014) reveals another key issue in which ISO documentation leads to more paper work and ends up filling various forms. At the site level, Scott and Assadi (1999) found two categories of problems, problems with site procedures and problems with site staff and record keeping.

These problems can be overcome by gaining knowledge and understanding of proper DMS. As Backblom, Bjork and Ruotula (2003) identified, improvements in the efficiency of a construction process will result from creating an awareness of the documentation value. Documentation should not be seen as a burden, but as a reflection of the way things are done (Li and Love, 2000). Staff must be trained because they have limited experience in procedure writing and reports (Li and Love, 2000; Darwish, 2007). The failure of proper documentation not only depends on the knowledge of the staff but also on the facilities given to the staff (Matheu, 2005). Reductions in the level of fees and the limited time made available to carry out the work contribute to this end (Darwish, 2007). Scott and Assadi (1999) suggested several ways to improve problems related to site procedures and staff. For example, better-organised methods with proper guidelines and inspections could be adopted to improve site procedures. These authors further suggested training and educating site staff, not only by giving adequate time but also by employing dedicated staff for record keeping.

Any improvement in documentation quality would lead to corresponding improvements in the construction process (Backblom, Bjork and Ruotula, 2003; Lamprecht, 1993). Once developers fully understand the important value of documentation process quality, they would ensure that sufficient time and fees are available (Darwish, 2007). Matheu (2005) stated that contractors must be financially accountable for the overall documentation quality. Thus, it is commonly believed that quality assurance is the most preferable method of regulating DM requirements in the construction industry.

Many construction companies in the world are registered with the ISO (International Standards Organisation), and these companies adopt quality management systems (QMS) that comply with ISO standards. The importance of DM in ISO-QMS has been well recognised. In fact, an effective DMS is a basic requirement for any organisation seeking certification with ISO (Anne, 2000; Lamprecht, 1993). Adoption of ISO leads to changes in many areas of record keeping, increasing the number of records kept and leading to a greater consistency between construction parties (Scott and Assadi, 1999). According to Li and Love (2000), ISO directs an organisation to document what they do and then act as they have documented.

Although construction companies in developed countries are ahead because they have access to newer versions, such as ISO 9001:2008, in countries such as in Sri Lanka, ISO 9001:2000 (Senaratne and Jayarathna, 2012) is the most popular QMS used by contracting companies. In ISO 9001:2000, there are five broad categories, of which the first category, the QMS, stipulates documentation requirements. Wedalleans (2005) identifies these document requirements using a pyramid analogy. Policy-level documents, such as Quality Manuals, are in the top layer, procedures are in the middle layer, and various forms are considered in the bottom layer.

Although the QMS stipulated by ISO states the importance of proper document treatment, they do not detail how to design and implement a suitable DMS to handle documentation and do not define its associated document processes (Hernad and Gaya, 2013). Hence, the standard is often experienced as being difficult to understand. Its flexibility and generic nature (Henry, 2000; Anne, 2000) have led many companies to create their own quality manuals. Accordingly, in some countries, the construction industry adopts a standard quality manual that corresponds with the quality standards. However, in developing countries, such as Sri Lanka, no formal attempts have been taken to do so (for example, see De Silva and Goonatilake, 2001; Pathirage, 2008), and not attempts have been made to fully understand the documentation requirements. Furthermore, a recent comprehensive literature review into IT-enabled DMS by Al Qady and Kandil (2013) shows that even some developed countries, such as Australia, are behind in IT-based DM implementations, while developing countries, such as Indonesia, are further behind. Hence, this study addresses this research problem by aiming to identify the current DM requirements in the Sri Lankan construction industry and to obtain reasons for poor DM and suggestions for overcoming these issues through a survey in Sri Lanka. The research method used in this study is explained in the next section.

## **RESEARCH METHOD**

Initially, a pilot study was carried out with three industry experts to list the main document management activities by ISO categories of a Sri Lankan construction company while also referring to project management manuals published in other countries.

The survey method was identified as the most appropriate approach for this research and considered the need to obtain more quantitative data and apply the findings to only a country-specific population. Sampling is an important aspect of survey design. Thus, selecting the most appropriate sample was a critical issue for research. In this research, 34 contracting firms who operate within Colombo and its suburbs in Sri Lanka were selected. The specific selection criteria were large contractors with Class 1 grade (based on the national grading scheme), who have ISO 9001:2000 certifications. Hence, it was expected that the selected sample would be representative of large contractors in Sri Lanka. From the 34 contractors selected to distribute the questionnaires, thirty responded, indicating a very high response rate.

The questionnaires contained two main sections in addition to the background information and covering the following information: (1) the document management requirements and the DM activities, together with the extent by which they are met in the current practice and (2) reasons why the requirements are not fully met and suggestions for overcoming these limitations. Each parameter was assigned a score based on a one to five point Likert scale.

After data had been collected, they were analysed using appropriate statistical analyses. In this questionnaire analysis, the Relative Importance Index (RII) was used as a statistical analysis tool. RII is a statistical measure often used in construction research to determine the relative ranking of the factors. In addition, qualitative data were gathered to triangulate the analysed results.

$$RII \text{ for groups} = \sum \frac{(W \times n)}{N \times A}$$

W = Weight given to each factor by respondents

A = Highest weight

n = Frequency of responses

N = Total number of respondents

Findings of this research are discussed in the subsequent section.

## RESEARCH FINDINGS

The questionnaires were completed by a construction professional who was an expert in DMS activities for each company. The 30 respondents included eight project managers, four senior engineers, two civil engineers, six site engineers, eight quantity surveyors and two site representatives. Project managers and quantity surveyors were mainly targeted among these respondents because they conduct most document management activities in the construction industry.

### DM Activities in Construction: Need vs Practice

The respondents were given the 40 DM activities related to construction and were asked to identify to what extent documents are needed for each identified activity to comply with ISO standards. To assess this, they were asked to rank the items on a five point Likert scale, with 5 being "strongly agree" to 1 being "strongly disagree". At the same time, they were questioned to identify to what extent this requirement is currently met (or practiced) by appropriate DM activities. To assess this, the respondents were asked to rank same activities on a five point Likert scale, with 5 being "always" and 1 being "not at all". The difference showed the gap between current DM practices and the overall requirements. Table 1 illustrates the results with RII values.

When comparing the results, documents related to communication, in particular, "to guide communication (including specimen letters) with client/consultant" (0.94) and "to guide communication with other site personnel/subcontractors" (0.93) were identified by the respondents as most required. Further, documents "to define the job descriptions, responsibilities and authority of key site personnel" (0.93) and "to describe the construction processes" (0.93) were highly required. Documents "to specify training to be provided for site personnel" (0.77) were identified as the least required. In terms of current practice, the need for documents "to describe the construction processes" (0.87) was met at the highest level, whereas the lowest need, at 0.77, was for documents "to specify training to be provided for site personnel". Therefore, the findings reveal that for some activities documents are highly required and also highly used, including documents "to describe the construction processes". However, looking at the gap (difference between the need and practice), documents for some activities were significantly required but less used, such as for "managing risks during the





















