

Document Management Systems in Small and Medium Size Construction Companies in Jordan

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Abstract

Document management systems (DMS) are now becoming more crucial requirement for the management of increased complexity of construction projects. Most of the contractors in Jordan are small and medium size companies. Also, many of the large size contractors tend to assign subcontractors of small and medium size companies to carry out projects. However, small and medium size contracting companies may lack proper systems and may have problems in the processes of document management, which may negatively affect the work performance and may cause delays in the construction projects. This research aims at investigating existing manual or computerized DMSs in small and medium size contracting companies in Jordan.

An extensive review and analysis of DMSs in the literature was carried out to define components and characteristics that can be critical for successful application of DMSs. Interviews with practitioners of DMSs from a number of small and medium contracting companies were conducted. The aim of the interviews is to investigate the processes, problems, challenges and opportunities to improve existing DMSs in the studied companies. The interviews are used in this research to assess the applicability and usefulness of developing and applying a computerized DMS for small and medium contracting companies.

Keywords: Computerized document management system, construction projects, Interviews with practitioners, small and medium contracting companies.

Introduction

Definition of DMS

DMS can be defined as the coordination and control of the flow of electronic and paper based documents in a secure manner to be used efficiently by authorized personnel as and when required (businessdictionary.com, 2015). Flow of documents can include storage, retrieval, processing, printing, routing, and distribution of business documents. Furthermore, digital DMS can be defined as the software application that collect documents (paper-based or electronic) for the secure storage, retrieval and archiving of these documents (Laserfiche, 2007).

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Importance of DMS

With new economy increasingly becoming a more knowledge-based economy, knowledge is becoming the most important asset for organizational success among other assets such as capital, materials, machineries, and properties (Kelleher & Levene, 2001; Fong & Wong, 2005). Document management is part of the wider concept of knowledge management that in addition to documents it includes sharing experiences and know-how (Tserng & Lin, 2004).

Drivers of DMS

Traditional manual methods of filing construction project documents are more common in the construction companies in Jordan because it is expected by organizations that they are easier and have lower cost to apply. However, these methods are not effective for information retrieval and need previous knowledge and understanding of document content that require high capabilities and time consumption from the seeker (Al Qady & Kandil, 2014). By using quality digital DMS, organizations should be able to reduce the overall document-related costs, and improve the efficiency of work processes and procedures in order to address the specific business procedures and needs. Many organizations have claimed saving time and efforts, increasing productivity and profitability, and improving coordination and collaboration among end-users (Laserfiche, 2007).

Aim of the Research

This research seeks to investigate existing DMS in small and/or medium size construction companies in Jordan. The research will highlight the use, components, challenges and motivation to apply DMS and their contribution to the organizations. Advantages and disadvantages, and opportunities to improve existing systems and integrating them with other systems in the organization will be studied.

Method of Research

This research aims at investigating components, importance, motivations, challenges, processes and practices of DMS in small and medium size construction companies in Jordan. Related literature will be reviewed to provide fundamental understanding and strength to the research.

In this stage of the research, interviews with practitioners of DMS in construction projects are conducted. Interviews with open-ended questions help to investigate important aspects of existing DMS in the interviewees' organizations. Furthermore, it helps to collect interviewees' opinions that help to understand motivations, challenges, important components and characteristics, opportunities and applicability of more advanced Electronic Document Management (EDM).

Simple note taking was the method adopted by the research interviews to encourage respondents to provide useful detailed opinions and ideas, and to identify and discuss important topics, which enabled the research to identify issues that can be important for the adoption of successful DMS for construction projects.

However, the responses and results were filtered to insure the exclusion of unnecessary irrelevant outcomes. Also, the respondents were given the opportunity to review their responses in order to edit contents and provide comments. In some occasions, opinions from respondents were discussed with other respondents to collect feedback, refine results and

improve outcomes. Also, some face-to-face discussions were arranged to encourage discussion and solve problems.

The current and future stages of this research are summarized in Figure 1.

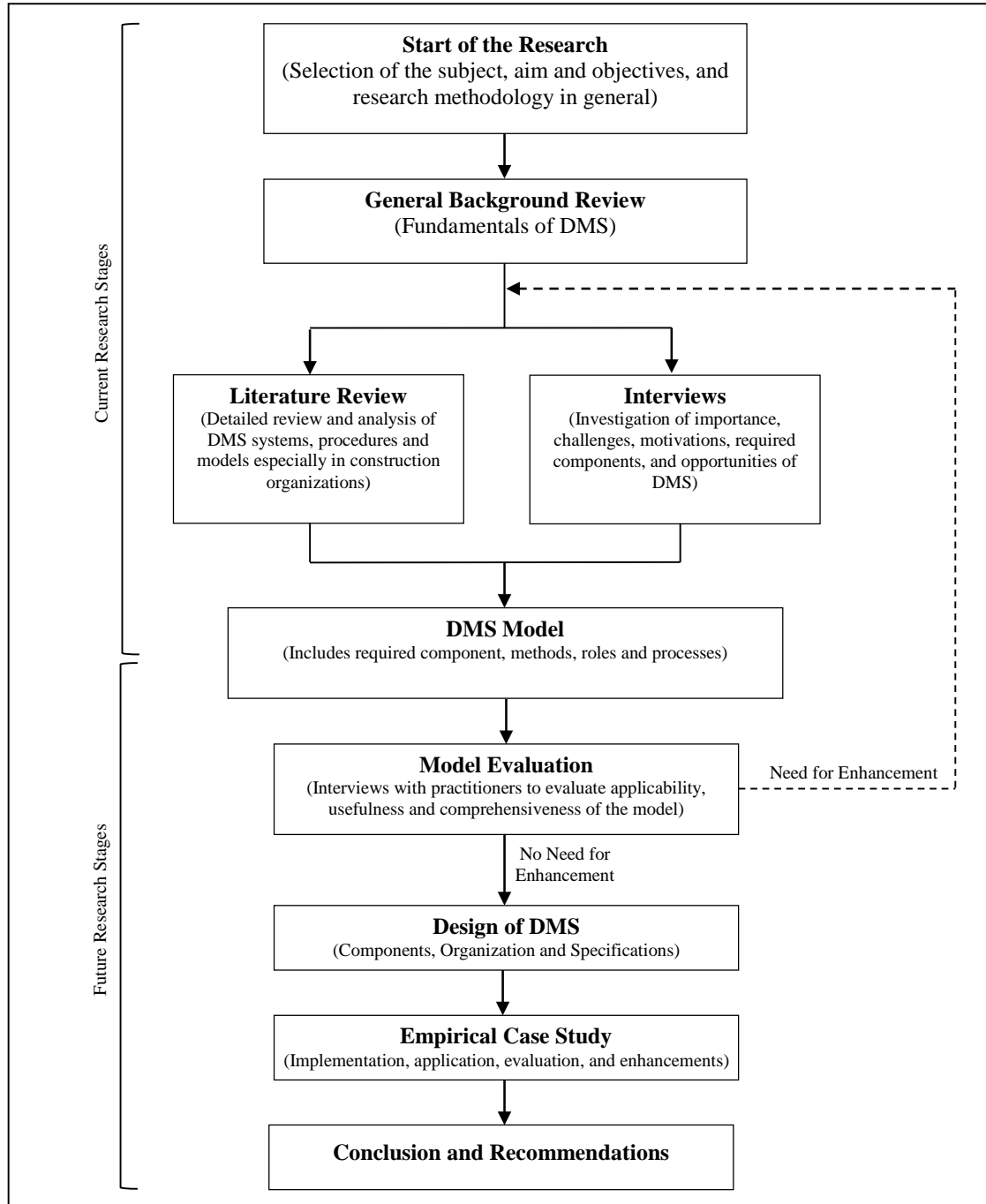


Figure 1. Research Model

Literature Review

Models and Techniques of DMS

Aurelia and Ana (2008) proposed a model for DMS by using Visual Paradigm for Unified Modeling Language (UML). This environment is used for designing information system object-oriented models and for generating the required code in Java Language. The authors have concluded that the UML language is relatively easy to use, ensures extensibility and formulates specifications independent of a certain programming language and system working processes.

Al Qady and Kandil (2010) have presented a technique to improve managing knowledge contained in construction documents. Their research attempts to improve document categorization and retrieval by analyzing the contents of documents using natural language processing. Techniques were used to extract semantic knowledge from construction contract documents that can be used to improve EDM functions. Al Qady and Kandil (2014) have presented a method to overcome the restrictions imposed by the traditional supervised learning text classifiers, which require a comprehensive training set to classify new instance. An unsupervised learning method was used in this research to automatically cluster documents together based on textual similarities.

Research conducted by Rujiranyong and Shi (2006) presented a design of a project-oriented database that consists of 26 tables that are connected to each other through primary and secondary keys. Using data processing tools such as data mining, analysis and reporting will help to add meaning to data and transform them into knowledge that is more useful in problem solving and decision making. This will increase its value to other users. The presented data warehouse can maintain data from different existing software systems. It associates data of each project so that a user can retrieve information combined with required background information of the related project. The components of the proposed data

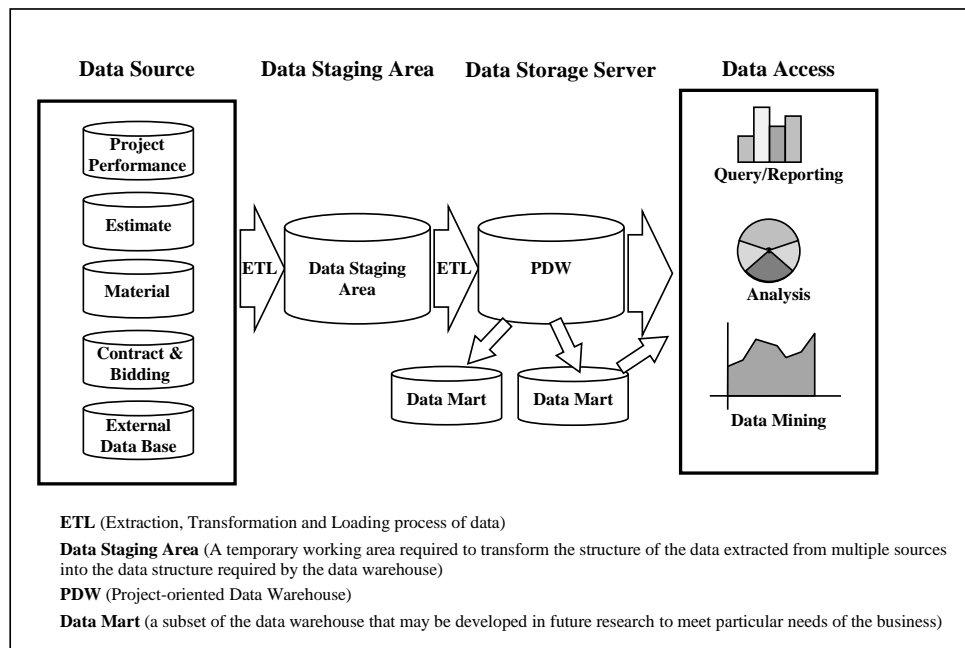


Figure 2. The Project-oriented Data Warehouse Architecture (Rujiranyong & Shi, 2006)

Adoption of DMS

An empirical research by Backblom et al. (2003) studied the usage of EDM systems in the Finnish construction industry. Telephone interviews with key personnel from 100 randomly chosen construction projects were conducted. The results showed that about one third of large projects have already adopted EDM, while only very few small project have adopted this technology. The results have also showed the use of EDM systems is yet incomplete in coverage and only small part of the involved individuals in the project can use the system efficiently. Main barriers to the efficient use of EDM systems include the psychological nature and insufficient training of end-users.

In the same previous research project, Bjork (2003) has surveyed and investigated individual research efforts in EDM systems for questions including the required specifications, frequency of use, measuring of benefits, barriers to wide-spread adoption, problems of application, scope for standardization, and evolving of the market of such systems.

Barriers of DMS

Furthermore, Bjork (2006) has investigated the use of internet-based DMS in the project-based construction industry. The results showed that the main challenges for applying EDM systems successfully are related to psychological and management issues. Among the challenges discussed are the complexity of contents' structure, the use of paper documents in parallel with electronic ones and the difficulty of measuring the benefits of applying the system.

Interviews

The interviews follow semi-structured approach, which means that a procedure will be used in the interviews, but the interviewees will be given to refer to and discuss their opinions and interests in the field. This also means that questions that are not included in the questions' list can be asked regarding details and description on things mentioned by the interviewees (Bryman & Bell, 2003).

In this stage of the research, interviews with six people from the construction industry known of having good background in DMS were conducted. All interviewees are site managers with experiences of more than eight years. The responses were filtered to exclude any unnecessary irrelevant outcomes.

Outcomes of the interviews can be summarized as follows:

- Although, many of the documents and transactions in the construction projects are electronic, most of the contracting companies especially small and medium size companies still lack the adoption of EDM systems, and lack integration between the existing DMS and other existing systems in the organization.
- Many of the contracting companies, especially small and medium size companies, lack the adoption of consistent system for document management, i.e. a company may have different categorization methods of documents in the various projects.
- The interviews with practitioners have highlighted the important components that are required for a successful EDM system.
- Normally, in construction companies using paper-based filing systems, engineers may find difficulties in storing, categorizing and retrieving required information or

documents. In addition, paper-based files may not be stored for more than 3 or 5 years in many of the construction companies, that might cause loss of important data.

- The interviews have highlighted some of the important documents and references, which are important to be available in EDM systems.

Challenges for applying successful EDM systems according to the interviewees' opinions can be summarized as follows:

- Time pressure of work duties in the construction projects may cause difficulties for engineers to learn the new processes of applying the new EDM system.
- Integrating DMS with other systems in the construction companies may require new additional procedures to be applied in the construction projects that may require more efforts from the existing employees or may require the appointment of new employees.
- Many of the employees may resist having to learn new methods and procedures of new work systems, and prefer the familiarity of using the old routine of doing jobs.
- The difficulty of convincing the management of the organization about the importance, feasibility, and future benefits of applying the new system.
- Lack of regulations and instructions that direct contracting companies toward applying EDM systems in the construction projects.
- Lack of required technologies and/or knowledge in many of small and medium size construction companies for applying new advanced IT systems.
- Such systems may involve high cost to implement, apply and maintain, while the expected benefits may require relatively long time to be achieved.
- Regulatory aspects of copyright and information privacy should be respected in the design, implementation and application of the new system.
- Information stored in the electronic system should be maintained against intruders and from being lost.

Motivations of applying electronic DMS according to the interviewees' opinions can be summarized as follows:

- EDM system can simplify storing, retrieving and combining information that can help in business processes such as decision-making and reports' preparation.
- There is a need to improve employees and management awareness about the benefits of applying advanced EDM system in the organization.
- There is a need to improve end-users' awareness about the capability of the system to protect the privacy of the contents and block undesirable intruders by providing predefined authorities.
- Availability of backup copy of the system content can protect important information from being lost.
- Applying electronic systems that is available for use through internet can simplify and allow end-users to easily retrieve required information from anywhere at any time.
- Availability of data and information of previous projects that is easy to access can help junior engineers to learn in short time compared to the time needed for learning during projects' life-cycles.

- Electronic systems can be encouraged if they are listed in the tendering document as a requirement that should be provided by the contractor. In addition, listed e-mail addresses of personnel can be officially approved for correspondences in the construction project.
- Integrating DMS with other systems in the organization may reduce time and effort of reentering data and transactions in the projects and the head office.
- Integrating DMS with other systems helps to provide quality information that can help organizations to improve work processes and decision making in the construction projects.

In general, the interviews have showed that the use of paper-based DMS is more common in small and medium contracting companies in Jordan. However, the adoption of such systems may cause delays and difficulties in business processes, and loss of important information and knowledge. Although, many challenges can affect the application of EDM systems, small and medium contracting companies should adopt techniques and technologies to encourage the implementation and application of successful EDM systems.

The interviews have investigated available categorization systems of the documents and data in the studied organizations. Although, the available DMSs are paper-based, it is useful to study their components to understand the required components of the EDM systems that need to be developed for these organizations. The main categorization of the documents and data can be summarized as shown in Figure 3. This categorization method is general, while detailed categorization should be unique to reflect the special methods of doing business for each organization.

Conclusion

Although most of the documents in the examined organization are in electronic formats, it was noticed that there is still a need for an effective DMS in order to achieve successful results within the organization. However, one of the barriers that may stop construction companies from adopting electronic systems is that implementing and applying these systems may need a major investment of time, effort and money, while benefits may need time to be noticed.

Another barrier is that employees may be unwilling to learn the new methods and procedures of applying a new system. This can be mitigated by applying user-friendly systems or systems that are similar to the existing systems that the end-users may be familiar with. Applying EDM system can help to improve the learning process of the organization.

Recommendations and Future Research

Future research will aim at conducting more interviews with practitioners in a number of construction companies. Furthermore, the coordination and interrelation between DMS and other existing systems, such as: Accounting Information, Human Resource Management, Inventory Management, Procurement Management, Customer Relationship Management and Quality Management Systems, will be studied in the companies.

This will help in developing, evaluating and enhancing a proposed model for an effective DMS. Future stages of the research will aim at developing and applying a computerized DMS for contractors and integrating the DMS with other available systems in the company. The developed system will be evaluated and tested for the applicability and usefulness to the work processes in the construction projects of different sizes.

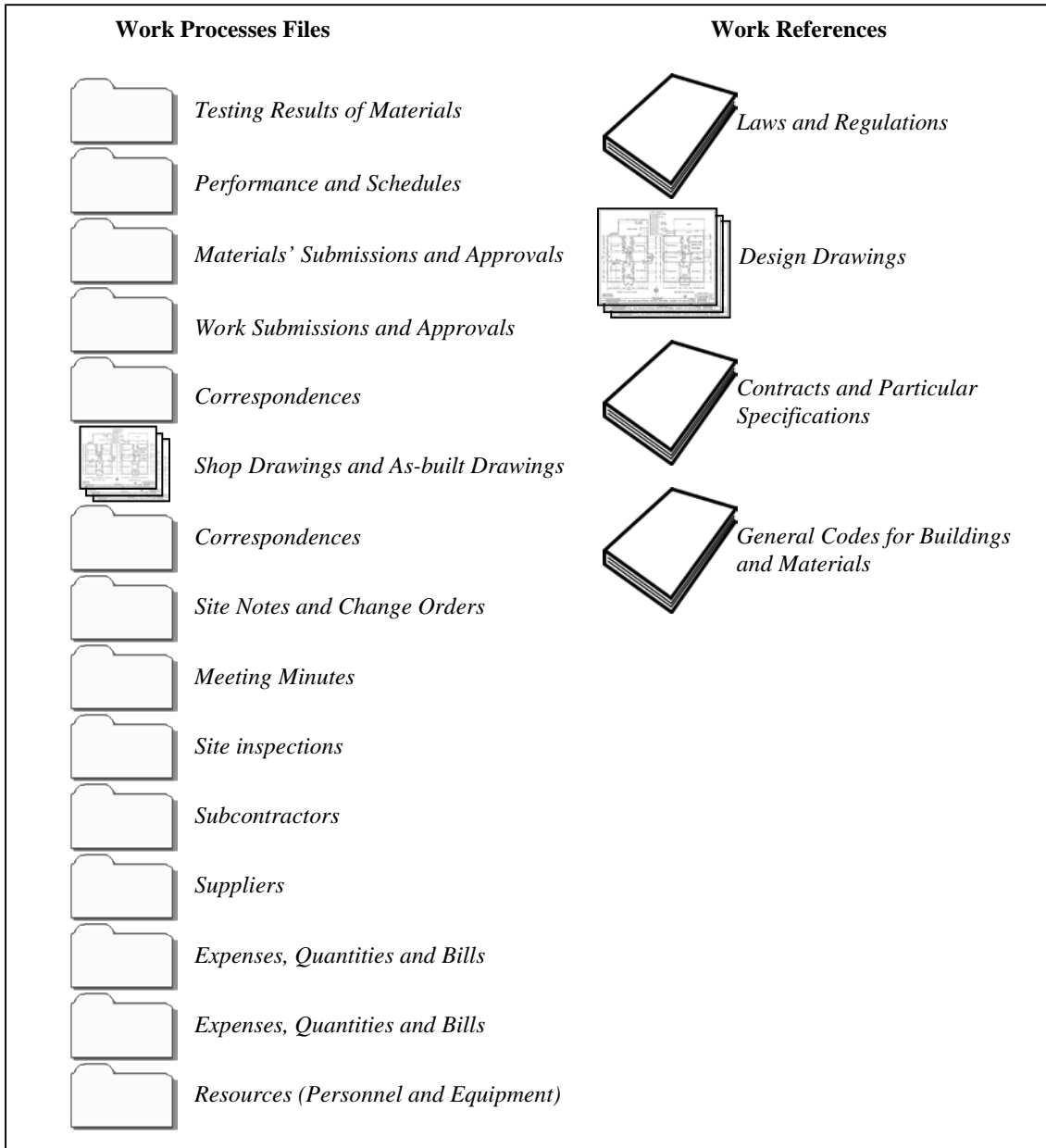


Figure 3. General Categories of the Documents and Data in the Studied Construction Projects

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