

Promoting transactions for A/E/C product information

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Abstract

Current approaches that support the transactions of A/E/C product information are not able to handle issues including ambiguous textual product information, domain knowledge utilization, and information comprehensiveness all at one time. Therefore, this researcher has developed a knowledge-supported approach to tackle the recognized issues to obtain an increased amount of product information from the available market, as a way to promote A/E/C product information transactions. Specifically, two strategies including automated query expansion and conceptual indexing that incorporate domain knowledge into Information Retrieval (IR) models were adapted and tested to compare with an existing search engine their capabilities in gathering additional product information. It was concluded from the investigation and testing that existing domain knowledge can be helpful when used adequately with IR operations to promote the transaction of A/E/C product information.

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1. Introduction

The value of products procured for a construction project usually compiles a large portion of the total project cost. Typically, in the UK, products accounted for 40–45% of the total cost of all construction work [1]. In the US, different ratios have been reported by various cost index publications but in general, costs occurred by products are at a large portion of the total project worth. Because of the high percentage of product costs, project participant have had to search for and deal with a large amount of product information.

For example, A/E (Architect/Engineer) designers usually search for existing product information in the design stage of a project in order to refine project specifications. During bid preparation, bidders analyze tender documents and explore the product market for price assessments. After a contractor wins a bid, when a situation occurs that requires a substitution, the contractor often has a great deal of time researching product information in order to identify the or-equal alternatives. This is also true for operation and maintenance, where often a facility manager has to look for replacements when a built product is out-dated or malfunctioning. The need to capture

product information occurs repetitively throughout the life cycle of a construction project.

By capturing an increased amount of relevant product information from the available market, project participants can improve their understanding of the product market and increase the value of their decisions related to product specification, selection, and procurement applications. One scenario that describes this increase in decision value can be given by the preparation of project specifications. After the design stage, during project construction, A/E designers commonly discover undesired products that should have been excluded as well as better products that should have been included in the specifications. Intuitively, lessons learned can be used to accumulate past experiences and avoid the same mistakes. However, a more proactive approach is to thoroughly explore the product market and acquire as much relevant information as possible before finalizing project specifications.

If product information is viewed as one type of merchandise, then we can consider the process of acquiring relevant product information as a transactions between product information seekers such as A/E designers, bidders/contractors, and facility managers, and product information providers such as suppliers or manufacturers. The main interest for this ongoing research is to promote this type of transaction such that an A/E/C information seeker can identify more information providers

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A/E/C Third Party Intermediary	Known Challenges for A/E/C Third Party Intermediaries		
	Allowable Data Format	Domain Knowledge Utilization	Information Comprehensiveness
Information Aggregator	Semi-structured	Partially	Incomplete
Electronic Catalog	Structured	Partially	Incomplete
Search Engine	Non-structured	No	Semi-Complete
Human Experts	Non-structured	Yes	Incomplete

Fig. 1. Comparisons for the existing A/E/C third intermediaries.

so as to acquire from them unique product information for comparison. Specifically, the goal is to capture more product information from the available product market, in an efficient and practical manner and with affordable computing equipment. One may argue that it is the information seekers who decide how to leverage the increased amount of product information gathered. However, this research intends to provide the possibilities of obtaining more product information for that the additional information can make positive impacts. That way, not only A/E designers, bidders/contractors, and facility managers will be able to use the additional product information to improve their understanding of the product market during decision making, but suppliers/manufacturers will also be to market their products to a larger consumer base.

This paper introduces an investigation on promoting the transactions for A/E/C product information. In Section 2, the challenges the difficulties associated with product information transactions within A/E/C are described. In Section 3, relevant research is reviewed and compared for further investigation. In Section 4, the approach of this research is defined, along with the prototype utilized to test the query expansion and conceptual indexing strategies. In Section 5, prototype results and lessons learned are presented. In Section 6, conclusions from this research are stated.

2. Problem overview

Theoretically, it is desirable for A/E/C product information seekers to look for as much relevant product information as possible. In reality, this can be very unfeasible because searching for relevant product information requires effort and resources while they are limited for any information seeker. The significance of efforts and resources needed to search for relevant product information is associated with the type of product being evaluated and the frequency with which a product is acquired. Common bulk materials, such as cement, are less a concern because an alternative product can be easily found from several available suppliers. When a product is very unique due to its proprietary fabrication process or because of user preference, searching for alternative options is unnecessary and thus requires no significant efforts or resources to capture product information for comparison. When a product has mixed types of properties (example: some specific and some standard) where alternatives cannot be easily identified, if

there is a repeated need to purchase the product, then buyers, such as contractors, can establish long-term agreements with the suppliers/manufactures. However, if the product is needed only occasionally, for example, a skylight, then a significant amount of effort and resources are required to obtain relevant product information. In that case, the transactions of A/E/C product information can be very frustrating and difficult.

Williamson [2] recognized a three-party (i.e., trilateral) organization as the most efficient way of handling such transactions and alleviating the needed efforts and resources for extensive searches. In a trilateral organization, a third-party intermediary (i.e., information broker) is utilized to provide services such as a lower buyers' overhead when searching relevant product information. There are several intermediaries (i.e., information broker) that can be utilized to provide information for a given type of A/E/C product. Major intermediaries are information aggregators such as SWEET's [3], electronic catalogs such as GlobalSpec¹ for electrical and mechanical engineering products, search engines such as Google,² and human experts.

However, there is limitations in the effectiveness or scalabilities of these intermediaries considering that the task at hand is to explore the whole available product market. These limitations are caused by the nature of transacting product information under current practices. First of all, most published A/E/C product information is in external format, not structured for automatic analysis and retrieval. Second, project participants use different ways to describe similar products and so domain knowledge is greatly needed to identify synonymous product names and product properties. Third, with the advancement of Information Technology, a rapidly increasing amount of A/E/C product information is now available online, which further expands the virtual market but at the same time deteriorates the rate of desirable information retrieved.

Fig. 1 compares the four intermediaries based on the three previously defined characteristics associated with transacting A/E/C product information. This comparison helps identify the advantages and disadvantages of each intermediary so that an appropriate strategy can be drafted to aid discovering

¹ <http://www.globalspec.com>.

² <http://www.google.com>.

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