



Repertory grid technique in the development of Tacit-based Decision Support System (TDSS) for sustainable site layout planning

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ARTICLE INFO

Article history:

Accepted 26 February 2011

Available online 25 March 2011

Keywords:

Tacit-based Decision Support System (TDSS)

Project management

Sustainability

Site layout planning

Repertory grid techniques

ABSTRACT

Site layout planning is a significant but relatively ignored work on construction site, which has been treated improperly as somewhat routine. It is known that the complex interrelationship of material, equipment, laborers, space, environment, access road, surrounding buildings, and building types affect the productivity and efficiency of a construction process. This complexity was inhibiting the smooth flow of resources especially when many trade contractors were working simultaneously on site. The study aimed to extract a set of core factors in site planning focusing on the tacit knowledge acquisition process to develop a Tacit-based Decision Support System (TDSS). A combination of the repertory grid technique and open-structured interviews was conducted for the tacit knowledge acquisition process. Cluster analysis and repertory grid analysis on the extensive responses from a structured interview were conducted. A computer program entitled "TDSS" was developed as a flexible tool to assist both senior and junior site layout planning engineers.

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1. Introduction

Construction project consists of many different functions of work packages. The combination of these activities has made the construction industry a dynamic and competitive business environment. The site layout is always the important focus for every construction company to consider. Construction site layout planning has been a relatively ignored area in the construction management science, compared to other studies such as the cost estimation and the schedule planning [1]. In research, the site layout planning is certain to rise up again to a more important position in the whole construction process. Construction space is always the first place to study in visual 3D construction process research [2]. Construction site layout planning should be one of the areas for research, for instance, how big a place, when, what places should be allocated and arranged during a construction period has been a challenge to evaluate.

Construction site layout planning in this paper reports on how to provide a good layout within a construction site and around the end product (building) by eliciting the principles that lie inside the construction expert's mind. Besides the objective in finding the principles on the construction layout planning, there was another objective in this research, which was to use the repertory grid, a psychology tool developed by George A. Kelly [3], to perform the knowledge acquisition process. This is the first time that such a technique has been applied in construction site layout planning.

Common sense and experience are always used by the construction experts all over the world. These types of knowledge are often implicit, hidden and lie inside the experts' minds. Most of them are lost when the expert retires or changes his job to another field. This kind of loss is no longer affordable to the construction industry in this modern age. To be a competitive construction company, the first stage to stay competitive is to find a knowledge acquisition tool to extract the tacit knowledge from the company's experts and any other sources. The next stage is to build up a distribution network for all employees, including setting up the learning-based expert system. Therefore, the main objectives in this research are 1) to retrieve the implicit knowledge of the high-rise building site planning experts; 2) to determine the principles that lay behind the planning of construction site layout; and 3) to develop a Tacit-based Decision Support System (TDSS) to support construction planning engineers. As one result of this study, a knowledge framework on construction site layout planning is preserved. For the knowledge acquisition process, the repertory grid technique provided a scientific and reliable method to elicit that important implicit knowledge. Main factors and principles of construction site layout planning have been revealed. Finally, a Tacit-based Decision Support System (TDSS) has been developed for the sustainability in site layout planning.

2. Overview of Key Concepts

Knowledge can be grouped into two main types, namely: explicit and tacit forms. Explicit knowledge is the knowledge that can be recorded through database, while tacit knowledge is only stored inside a human head, such as those common sense or experience [4].

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