



Balanced sustainable implementation in the construction industry: The perspective of Korean contractors



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ABSTRACT

Successful sustainability cannot be realized considering only environmental issues. Along with these, economic and social issues must also be considered in a balanced approach toward ensuring sustainability. In this study, the importance and performance value of factors related to these three issues as well as the gap between their importance and practical performance are investigated. In addition, correlations among these three issues are also examined by means of a survey of Korean contractors. According to data analysis results, there are large gaps between the importance and performance value of soft skill and long-term benefit factors. Moreover, it is found that balanced application with economic and social issues is more essential for sustainable development, even if environmental factors are revealed as quite effective. Environmental factors generally are closely correlated with economic factors, except for several social factors that have the strongest correlation with environmental issues. Hence, from the perspective of Korean contractors, a balanced application between important and tangibly performed factors as well as between environmental, economic, and social issues is essential for successful sustainability and not just the application of an isolated dominant factor.

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1. Introduction

Since the Industrial Revolution, the world has witnessed rapid industrialization, excessive urbanization, unsustainable economic growth, and a corresponding increase in resource utilization. In recent decades, the world has become aware of the negative effects of these activities [1–3]. The international community is also beginning to recognize the importance of sustainable development, that is, the harmony of the environment with industrialization. According to the United Nations World Summit [4], economic development, social development, and environmental protection are interdependent and mutually reinforcing sustainable development. Therefore, it is important to maintain the balance between environmental, economic, and social objectives harmoniously for sustainable development [5]. United Nations Economic Commission for Europe [6] reported that the construction industry contributes to over 6% of the global gross domestic product (GDP) and around 10% including relevant industries such as real estate

or manufacturing [7]. Simultaneously, the construction industry has also had an enormous impact on the environment as compared to other industries [8]. In this situation, the construction industry needs to find a solution that will harmonize development with the environment. Sustainable development is an indispensable concept for solving environmental problems. It is the most important and challenging issue faced by the construction industry [9]. Many advanced and developing countries have already introduced sustainable building assessment systems, and extensive research is being conducted in the field of sustainable construction. The more widely known include the BRE Environmental Assessment Method (BREEAM) in the UK and the Leadership in Energy and Environmental Design (LEED) in the United States, the Evaluation Standard for Green Building (ESGB) in China, the Eco-Management and Auditing Scheme (EMAS) in the European Union, Comprehensive Assessment Scheme for Built Environment Efficiency (CASBEE) in Japan, Sustainable Building Assessment Tool (SBAT) in South Africa [10,11]. Several assessment tools can be used to manage sustainability issues at the construction project level. However, most of these tools and studies concentrate more on environmental factors than on the economic and social dimensions. For instance, most of the rating content of international sustainable building assessment tools, such as BREEAM, LEED, SBTool (Sustainable Building Tool), and GBCC (Green Building Certification Criteria) in the Korea

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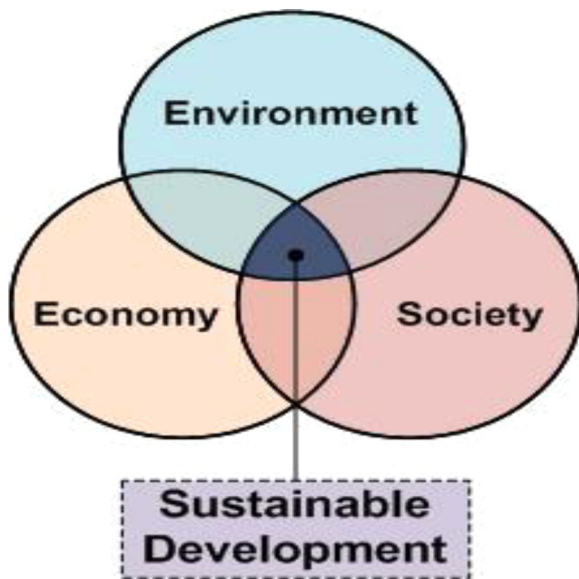


Fig. 1. Themes of sustainable development [14].

are focussed on only environmental issues such as energy efficiency and resource conservation [12]. More than half of the global research on sustainable construction has been focused on environmental factors, and hence, there is a serious lack of studies and tools based on economic and social issues.

According to Riley et al. [13], contractors have an increasing role in the implementation of sustainable building projects. All the stakeholders involved in a construction project, including the client, the designer, and even the government, play an important role in ensuring sustainability. However, it is the contractor's awareness and performance regarding sustainability that has the greatest effect on delivering a sustainable solution. This study aims to evaluate the level of awareness and performance regarding sustainable construction and the specific value of sustainability factors are obtained from the viewpoint of contractors in Korea. Therefore, this research also could be an assessment of factors for successful implementation of sustainable construction project in Korea. The result of this assessment would be useful to provide recommendations for overcoming the current barriers to the successful integration of environmental, economic, and social issues.

2. Literature review

At present, environmental protection is recognized that it is related not only sustainable element, but others including economic and social elements [5]. Sustainable development is based on three foundations: environment, economy, and society, as shown in Fig. 1 [14].

According to the International Council for Research and Innovation in Building and Construction [15], there is a general perception that sustainable development should be seen as an integrative and holistic concept, striving for harmony and balance among the three elements. This balance is crucial in the construction industry, because of the strong impact it has on the environment, economy, and society, as compared to other industries [5,15,16]. Moreover, the construction industry offers different kinds of infra-structure such as factories, roads, bridges, dams, and other facilities, which affect society and the economy. Houvila and Koskela [17] argued that sustainable construction should be considered in a global context and must move away from the traditional construction process, which focused on time, cost, and quality, to a new paradigm as shown in Fig. 2. This involves creating synergistic relationships

between the environmental, economic, and social aspects of sustainability [18]. To achieve sustainable construction, it is important to implement a balanced and harmonized approach which integrated diverse sustainable aspects including the above three aspects and move away from the distorted approach, which focuses on environmental impacts in construction industry.

However, despite the insistences on balanced development, environmental research have been much more than other research subjects such as economic and social aspect. Research regarding environmental aspect is somewhat more easily to be conducted than economic and social researches which are related diverse and complex aspects outside the construction area. It is reason that despite the growing importance and role of economic and social aspects, there are more environmental researches in construction industry. In order to analyze this research trend, the present study examines approximately 900 research papers related to sustainable issues published by the ACSE (American Society of Civil Engineers, USA), ScienceDirect, and AURIC (Architecture and Urban Research Information Centre, Korea) between 1999 and 2013. Although there are diverse research issues in below institutions, because this research focuses and counts on only sustainable-related papers, sustainable research trend is analyzed by about 900 papers including environmental issue, economic sustainable issue, and social sustainable issue. Table 1 compares the number of papers regarding sustainable construction published by the three entities. Nearly half of the research is regarding environmental issues. In Korea, 62% of research is dedicated to environmental issues, while only 11% and 7% deal with economic aspects, and social issues, respectively. It means that specifically in Korea, despite the importance of other sustainable aspects, distorted research trend is dominant. Thus, there has been limited research into economic and social sustainability [18,19].

3. Factors affecting project success

3.1. Sustainable assessment tools

BREEAM was the first environmental assessment method in the world. It has four main aims and six objectives as presented in the BREEAM Fact File [20]. BREEAM awards credits according to performance within each issue, which are then added together to yield a single overall score on a scale of Pass, Good, Very Good, Excellent, and Outstanding. This score is represented by a star rating of 1 to 5 stars [21,22]. In 2006, the UK government developed the Code for Sustainable Homes, which aims at protecting the environment by providing guidance [21–23]. The Code includes 9 categories comprising 34 issues. Each category includes a number of environmental issues that may have a potential impact on the environment [24]. Mandatory minimum performance standards exist regarding the following four key issues: environmental impact of materials, management of surface water run-off from developments, storage of non-recyclable and recyclable household waste, and construction site waste management [24,25]. If the mandatory minimum performance standards for these four uncredited issues have been met, two more mandatory issues need to be considered: dwelling emission rate and indoor water consumption [24].

LEED, developed by the United States Green Building Council (USGBC), is a green building rating system that assesses the sustainability of green buildings based on their design, construction, and operation. LEED rates the sustainable performance of buildings over their entire lifecycle based on their environmental impact and sustainable features [26,27]. LEED has become the most widely recognized green building assessment system in the USA, and it is rapidly being adopted worldwide [28]. According to the USGBC [26], LEED for Homes is an assessment system that improves

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