

건설 산업의 시설물 자산관리를 위한 분류체계 역량

Breakdown Structures for Physical Asset Management in Built Environment

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Abstract

Breakdown structure (BS) is a tool used to allocate information packages for various management functions and drive computerized information systems. Although several BS exists, work breakdown structures (WBS) and cost breakdown structures (CBS) are the most widely studied and used in previous literature. Nevertheless, heterogeneity of BS and respective management capabilities in current practices are not adequately addressed. In this context, this paper compared the management capabilities of various BS in both building and plant industries through systematic literature. Management requirements and applications scope, in terms of life cycle and stakeholder, were analyzed, respectively. Finally, finding and lesson-learned are outlined.

키 워 드 : 분류체계, 시설물 자산관리, 생애주기, 참여자

Keywords : breakdown structure, management method, life-cycle, stakeholders

1. Introduction

Breakdown structures (BS) are being used to manage and control project elements in different life-cycle stages. BS is multi-faceted and specific in terms of management scope [1]. All BS follows a similar approach of hierarchically decomposing deliverable until a manageable unit is reached. From a historical perspective, work breakdown structure (WBS) is the primary and most utilized BS [2]. However, various BS are being used extensively in the building and plant industry to support the industries in achieving the project scope [3]. Nevertheless, the characteristics of industries have a significant impact on the BS's scope of application. Besides, the management capabilities of different BS have not been explored in previous pieces of literature. In this context, this ongoing study explores the management capabilities of various BS in both building and plant industries through systematic literature. Firstly, variables were identified to implicate the general application scope BS. Secondly, based on the variables, management capabilities of BS are presented based on a wide array of literature. Finally, Findings and implications are outlined in the conclusion.

2. Variables for BS Utilization Scope

A literature review was carried out to investigate and implicate the applicability of BS in three key variables: management method, life cycle, and stakeholder, as depicted in table 1. The first, management method, provide an overall understanding of BS utilization and related management requirement. The latter two (life cycle and stakeholder) provides the integration capability of BS in terms of the life-cycle process and respective stakeholder.

3. Findings

Performance and information are the primary management methods that most BS's are being utilized. However, in the plant industry, BS's also supports configuration, safety, and requirements management methods. In the building industry, BS's are mostly utilized in the engineering, procurement, and construction (EPC) stage of a facility. However, in the plant industry, BS's are being utilized in the entirety of a plant facility. In terms of stakeholder collaboration, object and task-oriented BS's (PBS, WBS, & FBS) enables integration.

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Table 1. Variables and Breakdown Structure Types

Variables	Management Method	Requirements Mgmt., Performance Mgmt., Information Mgmt., Configuration Mgmt., Safety Mgmt., Risk Mgmt., Handover Mgmt., Asset Mgmt., Operation Mgmt.
	Life-cycle	Early Planning., Engineering Design., Procurement., Construction., Start-up., Operation & Maintenance., Decommissioning
	Stakeholder	Facility owner., Designers., Contractors., Equipment Vendor., Facility operators
Breakdown Structures	Work Breakdown Structure (WBS), Cost Breakdown Structure (CBS), Location Breakdown Structure (LBS), Organization Breakdown Structure (OBS), Product Breakdown Structure (PBS), Functional Breakdown Structure (FBS), Risk Breakdown Structure (RBS), Information Breakdown Structure (IBS), Geometry Breakdown Structure (GBS), Requirements Breakdown Structure (RmBS).	

Breakdown Structure	WBS	WBS - CBS	WBS - OBS	PBS	PBS - FBS	PBS - LBS	PBS - WBS	FBS - WBS	FBS	RBS - WBS	RBS	IBS	GBS	RmBS
Authors	Al-Kanani et al. (2009) Jung & Woo (2004) Shim, Hwang et al. (2015) Ramanathan et al. (2016) Hannou et al. (2014) Seyoum & Lopez (2015) Ahn (2018) Corcoran & Ommasto (2020) Yang et al. (2020) Kang et al. (2019) Jung et al. (2020) Choi & Myung (2017) IAEA (2011) ISO/TC8/SC6 (2017) Choi & Goel (2006) Park (2016) Hameri & Nitter (2002) ISO 10648-3(F) (2003) Huguen et al. (2013) Habibi, Gohariyani & Esmailzadeh (2017) Jung et al. (2009) Jung & Jeon (2021) E. Hamer et al. (2016) Sigurdsson & Skjoldsvick (2014) Lee & Cha (2015) Lee et al. (2018) Jung et al. (2015) INZ (2008)													
Management Method	Performance Mgmt.	•	•	•	•	•	•	•	•	•	•	•	•	•
	Information Mgmt.													
	Handover Mgmt.													
	Configuration Mgmt.													
	Requirements Mgmt.													
	Safety Mgmt.													
	Risk Mgmt.													
	Knowledge Mgmt.													
	Asset Mgmt.	•												
	Operation Mgmt.	•												
Life Cycle	Planning													
	Engineering Design	•	•	•	•	•	•	•	•	•	•	•	•	•
	Procurement													
	Construction	•												
	Commissioning													
	O&M													
Stakeholders	Decommissioning													
	Owner-Operator	•												
	Contractor	•												
	Equipment Supplier													
Designer/Engineer														

Figure 2. Scope of BS for Physical Asset Management (Building, Plant Industry)

4. Conclusion

BS's are being used to control projects by decomposing project elements. However, Heterogeneity of BS, diverse management scope, and industry characteristics makes it difficult to reach a common understanding of BS. Despite, a wide array of literatures entailing the utilization of BS, there is a paucity of study exploring BS with respect to management requirements in the built environment. Therefore, this study, provides the utilization scope of multiple BS's with the identified variables.

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