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ANALYSIS OF PROGRAM MANAGEMENT CHARACTERISTICS FOR PERFORMANCE ASSESSMENT OF GOVERNMENT-LED MEGAPROJECTS

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Abstract: Recently, large-scale government-led city construction projects (Administrative City Construction Project, Saemangeum Reclamation Project, USFK Base Relocation Office Program) have been undergoing construction in order to achieve balanced national development, increase global competitiveness, and strengthen security in South Korea. The three megaprojects above share in common that they are government-led, long-term, large-scale, complicated and complex projects involving a large number of stakeholders. Accordingly, the government needs a step-by-step approach for performance assessment that is free from a single project management method in order to successfully carry out megaprojects that require large budgets. Therefore, in this study, the characteristics of the above three megaprojects are compared and analyzed to derive performance assessment from the program management point of view (interview with experts, etc.). This paper illustrates the importance for performance assessment by applying the AHP (Analytical Hierarchy Process) technique which can obtain objective and systematic results for identifying common points and derived factors. The results of this study are expected to improve the efficient use of budget resources and increase public convenience when applied to megaprojects in Korea, such as the Gadeokdo New Airport and Daegu-Gyeongbuk Integrated New Airport, as well as the Saemangeum reclamation project which is currently in its early stages.

INTRODUCTION

Recently, several government-led megaprojects are under construction in the Republic of Korea(ROK) to promote balanced national development, increased global competitiveness, and strengthened security. For balanced national development, the government has invested US$ 18.75 billion in public projects until 2030 to build an Sejong administrative city (73.0 km²) about 120 km south of Seoul. In order to increase global competitiveness, US$ 18.75 billion will be invested in land creation and infrastructure by 2050 to carry out the Saemangeum project (409 km²) that encompasses the economy, industry, and tourism. In addition, to strengthen the ROK -U.S. alliance, the military base construction project is being completed to integrated U.S. bases scattered across the country around Pyeongtaek and Osan.

The common features of the above three projects are long-term, government-led, large-scale costs, and complex megaprojects related to multiple stakeholders. Their success or failure can has a significant impact on the national and communities. Moreover, in order to cope with national growth and continuous industrial development due to technological development, it is expected that government-led megaprojects will continue to be promoted in the future. Accodingly, to successfully carry out megaprojects involving large scale costs, the government needes to approach program management to improve performance rather than from the existing single project management perspective. Therefore, this study derives factors of performance assessment through expert interviews by comparing and analyzing the characteristics of the above three megaprojects. And this presents the importance for factors of performance by applying the AHP technique that can obtain objective and systematic results for identifying commonalities and derived factors.

ISSUES ON GOVERMENT-LED MEGAPROJECT MANAGEMENT

The term "megaproject" appeared in the late 1970s when large-scale national projects were promoted (Altshuler & Luberoff, 2003). The megaproject can be said to be a large-scale project that affects a wide range of areas

such as the cost of more than US $1 billion, multiple stakeholders, high technoligy, various risks, long-term, complexity, and consideration of political and environmental changes. Examples of megaprojects include high-speed rail, airports, ports, motorways, disease or poverty control programs, hospitals, national infrastructure, the Olympics, dams, wind farms, large servers, offshore oil and gas extraction, aluminum smelters, new aircraft development, large-scale containers and cruise ships, high-energy particle accelerators, and logistics systems for large supply chains such as Apple, Amazon, and Maersk(Flyvbjerg et al. 2017).

It is required to efficient management techniques that analyze various issues and challenges arising from the project management process for the successful implementation of megaprojects with a complex structure. In particular, in the case of large-scale complex projects involving various types such as urban development, voluntary investment at the private level is not easy due to risk factors such as prolonged investment periods for development projects and initial land preparation costs. To solve this problem, the ROK government is striving to promote government-led urban development projects to promote entry into the domestic construction market and secure new growth engines for overseas construction.

In the case of government-led megaprojects, they are closely related to long-term national development plans with large-sacle costs and complex multiple stakeholders. Table 1 shows examples of cost overrun and schedule delays(Mun et al. 2007).

The failure of megaprojects can lead to significant losses such as excessive cost overruns, schedule delays, and lack of social and economic expected benefits. Efficient management techniques are urgently needed to prevent these matters. Therefore, this study attempts to derive management factors suitable for government-led projects to improve the performance of government-led megaprojects.

PERFORMANCE FACTORS OF GOVERNMENT-LED MEGAPROJECTS
GOVERNMENT-LED MEGAPROJECTS

SE-JONG ADMINISTRATIVE CITY CONSTRUCTION

For balanced national development and strengthening national competitiveness, Se-jong Administrative City (as "Administrative City") is being promoted as an urban development project in three phases until 2030 about 120km south of Seoul with an area of 73.0 km² and aims for 500,000 people by 2030. The Administrative City is being developed as a near-workplace city with six primary zones: Central Administration, Cultural and International, Local Administration, University and Research, Healthcare and Welfare, and High Technology. The Administrative City has successfully relocated 42 Central Administrative Organizations and 15 Government-Funded Research Institutes and completed major infrastructures in the central administrative area. The construction of the administrative city is overseen by the administrative-centered National Agency for Administrative City Construction(as "Administrative Agency") and various business entities, such as Korea Land and Housing Corporation (as "LH"), Ministry of Public Administration, Office of Education, Korea Forest Service, Korea Electric Power, and private companies. The project costs will be invest US$ 18.75 billion (US$ 7.1 billion from government, US$ 11.7 billion from LH) to complete 1,900 facilities by 2030. Therefore, the Administrative Agency is playing a role as a

Project name	Initial plan		Problem
	period	cost	
Development of a heavy ion accelerator	2011 ~ 2017	1.44 trillion won	delayed schedule : + 4 years increased cost : 73.8 billion won
Development of a ROK-type projectile	2010 ~ 2022	1.54 trillion won	delayed schedule : - increased cost : 41.23 billion won
Development of the Gyeongbu High Speed Railway	1992 ~ 1998	5.80 trillion won	delayed schedule : + 12 years increased cost :12.60 trillion won

Table 1: Experience of failures in Government-led megaprojects

Factors	Author
Appropriate organizational structure	Kiani et al. (2014); Cha et al.(2018);
Stakeholder identification and effective engagement	Delaney (2014); Kiani et al. (2014); PMI (2017); Thiry, M(2015)
Appropriateness of risk sharing, Careful project preparation	Lemoine (2015)
Project planning, Stakeholder management.	Spang (2015)
External stakeholder management, Governance and structure.	Mancini and Locatelli (2015)
Political context and Interfaces.	Hertogh (2015)
Strong and sustained leadership, Identifying project 'winners and losers'	OMEGA Centre, University College London (2015)
Transferring of risk, Estimation of complexity.	Henley (2015)
Ten megaproject characteristics and three common causes of megaproject failures	Flyvbjerg et al. (2017)
Uncertainty, Organizational change management.	Mancini (2017)
Agent changes, Policy led multi criteria analysis.	OMEGA Centre, University College London (2017)
Assigning and responsibilities	Axelos(2020); Thiry(2015)
Strategic alignment of program goals with organization strategy	Axelos (2020); Lock et al. (2016); Lycett et al. (2004)
Strong and integrated PMO	CMAA(2021); Kiani et al. (2014); Thiry (2015)

Table 2: Major Factors in Megaproject Management

comprehensive command tower to coordinate the entire urban construction.

The Administrative Agency was able to accumulate various know-how While carrying out large-scale national projects with the aim of building a sustainable model city. Starting with the "Convention on Cooperation in Capital Relocation" at the ROK-ASEAN Special Summit in November 2019, it is cooperating to export the know-how and platform for the construction of the administrative city to overseas urban development projects such as the construction of new administrative capitals in Indonesia. Systemtic management from the planning stage of urban construction will be applied to create added value such as future urban exports.

SAEMANGEUM RECLAMATION PROJECT

The Saemangeum Reclamation Project, which started in November 1991, was the world's longest seawall with a length of 33.9 km , and is a large-scale long-term land development project with a total cost of US$ 19.0 billion, aiming to complete the construction of 409 km² of land by 2050. The Saemangeum Reclamation Project was started to solve the food shortage problem and secure farmland, but due to economic development, the Saemangeum master plan was modified (30% farmland, 70% non-farm land) in 2011. The master plan was reestablished to supplement the limitations of the existing plan in 2021. Initially, Saemangeum Reclamation Project was conducted under the Ministry of Agriculture and Forestry, but more government agencies started to take part, such as the Ministry of Agriculture and Forestry, the Ministry of Land, Transport and Maritime Affairs, the Ministry of Environment, and adjacent local governments. However, the project was delayed due to the inefficiency caused by the participation of various government agencies, thus the Saemangeum Special Act was enacted and the Saemangeum Development and Investment Agency was established to provide general management tasks.

Since the completion of the seawall (2010), the Saemangeum Reclamation Project is in the process of reclaiming 291km² of land (22.4% completed, 24.8% in progress). For the complete site, it is actively promoting and planning secondary inducement facilities such as corporate investment attraction, farmland improvement, renewable energy projects, and various infrastructure. In addition, Saemangeum Development and Investment Agency is making various efforts to prevent interference, redundancy, and cost waste by performing comprehensive project management technology support services such as time and cost management and resource management in the lake.

YONGSAN RELOCATION PLAN

The relocation project of United States Forces Korea(as "USFK") bases is being carried out to unify and relocate U.S. bases scattered across the country for balanced national development and stable stationing of U.S. troops in Korea. The Yongsan Relocation Plan (as "YRP") will relocate US armed forces in Korea and 8th U.S. Army in Yongsan, Seoul to Pyeongtaek, Gyeonggi-do. And the Land Partnership Plan (as "LPP") will relocate the U.S. 2nd Division scattered in northern Gyeonggi Province to Pyeongtaek and other areas. The USFK base relocation project is to build 513 buildings on 14.7 km² of land in Pyeongtaek under the YRP and LPP plans, and is a massive construction project with a total cost of about US$ 13.3 billion. The relocation project began to be discussed in 1988, and the Special Act on Support for Pyeongtaek City Following the Relocation of USFK Bases was enacted in 2004, the Master Plan (as "MP")

was completed in 2007, and the Program Management Consortium (as "PMC") was selected in the same year. Construction began in November 2007 and the project went into the closure stage in February 2022. Various facilities are being completed and transferred, and the relocation of USFK bases to Pyeongtaek is underway.

The Korean government funds the cost of relocating the base. This required meeting the principle of minimizing relocation costs and the quality requirements of the user, the U.S. To this end, the two countries emphasized maintaining a cooperative system and efficient planning between Korea and the U.S. In addition, since many stakeholders, users, designers, and contractors are involved in each step, a project management organization with high technical skills was needed to perform each role smoothly. Since several projects must be completed within the agreed period between Korea and the U.S., it is recognized that the expertise in program management that manages a number of projects as well as the design and construction technology is a performance-generating factor. Individual projects and facilities are physically separated, but functionally interconnected, requiring planning, coordination and control at the integration level. Program management was applied to reduce the possibility of additional costs due to schedule delays and meet the needs of users in project that require large-scale project costs.

ANALYSIS OF PERFORMANCE FACTORS
CHARACTERISTICS OF GOVERNMENT-LED MEGAPROJECTS

The government-led megaprojects are complex projects involving various stakeholders such as the central government, local governments, and private institutions are involved and large-scale costs of the country are invested to to provide public services. In addition, independent institutions were established for efficient management and related special laws were enacted. It has a characteristic that political factors can play a role due to their large impact on political changes, conflicts bwtween stakeholders, and large derived effects of success and failure on the country or community(Kim et al. 2005). Accordingly, government-led megaprojects can be different from general (private) projects promoted to increase profitability for business purposes, and it is necessary to select and manage factors suitable for government-led projects from among the megaproject management factors derived from previous studies.

PERFORMANCE FACTORS

Megaprojects led by the government involve various causes that affect the success or failure of the project, such as irregular problems that occur from initial planning to the operation process. The primary management factors should be applied differently depending on the characteristics of the project. Therefore, in this study, the success factors to be managed in the megaproject were selected by investigating previous studies, and additional considerations, changes, and deletions were made through expert advices to derive factors suitable for the government-led megaproject. Firstly, about 150 factors were derived by investigating previous studies as shown in Table 2. For the derived factors, overlapping factors were removed and changed along with project management experts related to construction: university professors, government agencies, research institutes, PM companies, and construction companies. In addition, factors not suitable for the purpose were removed and necessary factors were added.

As a result, nine performance factors were

derived and they were comprised of three categories with reviewing the correlation between factors. Table 3 shows categories and performance factors.

PERFORMANCE FACTORS WITH AHP ANALYSIS

This study used the method of Analytic Hierarchy Process(AHP) to analyze and compare pairwise the importance of categories among factors of performance assessment for mage-project and the importance of factors within the category. A survey was conducted on 50 respondents, including govenment agencies, public institutions, private construction companies, business management consulting companies, universities, and research institutes, and secured 36 responses with a consistent CI of 0.2 or less. Table 4 shows the affiliation and working experience of survey respondents.

RESULT AND ANALYSIS

The weights of catefegories and factors of megaproject performance are shown in Table 5.

In the category, Strategy was high at 44.3%, followed by People and Structure at 36.7% and Process and System at 19%. In addition, Program Goals was the most important at 45.7% in the Strategy category, Leadership was 32.5% in the People and Structure. And in the Process and System, Risk management was found to be the most important at 59.9%.

Figure 1 shows the priorities of nine factors to performance in megaproject.

When looking at the importance of dividing into three categories and nine performance factors for government-led megaproject, Program Goals were the highest at 20%, followed by Governance, Benefit Management, and Leadership with an equal importance at 12%. The next order of importance is Risk Management, Stakeholder Engagement, and

Communication Management.

CONCLUSION

This study analyzed and ranked nine factors of performance assessment in three cartegories to successfully conduct Government-led megaprojects. The result showed that Strategy is most important in category, followed by People and Structure, Process and System. And among nine factors of performance assessment, Program Goals was highest raking and followed by Governance, Benefit Management, Leadership in similar proportion. This recognized that strategy is the most important due to the nature of government-led projects, and considering that the project is carried out based on stable national funds and strong project promotion capabilities, it was found that it is important to set clear goals, manage various stakeholders, and strengthen the government's strong and continuous leadership.

This study is meaningful in presenting success factors in implementing government-led mega projects, and it can be seen that a sufficient understanding of the characteristics of the government's organizational system and project promotion procedures is needed to carry out successful government-led mega projects. The success of government-led projects has a significant impact on national and regional communities by securing convenience and strengthening national competitiveness. Therefore, the factors of performance assessment derived in this study can be considerations for future government-led megaprojects, and it will be a reference for setting the priority of management factors through the importance of each factor.

Category	Factor of performance creation
Strategy	Program Goals Govermance Benefit Management
People and Structure	Leadership Communication Management Competency of owner Organization Stakeholder Dngagement
Process and System	Risk Management Program Life Cycle Management

Table 3: Category and Factor of performance creation

Classification		A Govenment	B Public Company	C Private Company	D. PM Consulting Company	E. Researcher
Total respondents(n=36)		5	13	5	9	4
Working experience	1~10 years	-	3	1	1	1
	11~15 years	4	2	1	7	-
	Over 15 years	1	8	3	1	3

Table 4: Respondents Information (n=36)

| Category	Weight 1	Factor	Weight 2
Strategy	0.443	Program Goals Governance Benefit Management	0.457 0.278 0.264
People and Structure	0.367	Leadership Communication Management Competency of owner Organization Stakeholder Dngagement	0.325 0.239 0.194 0.242
Process and System	0.190	Risk Management	0.599
		Life Cycle Management	0.401

Table 5: Weights of categories and factors
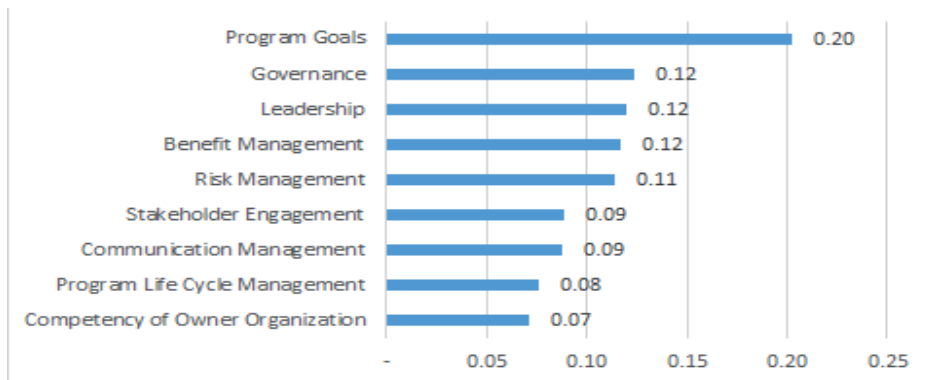
Figure 1: Priorities of factors

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