

THE KEY SUCCESS VEHICLES FOR FAST-TRACK IN PUBLIC DESIGN-BUILD PROJECTS

Kyu-Man Cho ¹, Kyo-Jin Koo ², and Chang-Taek Hyun ³

¹ Ph.D. Candidate, Dept. of Architectural Engineering, Univ. of Seoul, Seoul, Korea

² Assist. Professor, Ph.D., Dept. of Architectural Engineering, Univ. of Seoul, Seoul, Korea

³ Assoc. Professor, , Ph.D., Dept. of Architectural Engineering, Univ. of Seoul, Seoul, Korea

Correspond to chokyuman@empal.com

ABSTRACT: Nowadays the Design-Build Delivery Method in public sector has been remarkably grown up in applying owing to its merits such as shortening construction duration. The Fast-Track is the wide-using method for accelerating schedule at Design-Build projects. But the public agency is in trouble to execute Fast-Track because of the lack of guideline for its process. As a result, in some cases applying Fast-Track methods, cost and construction duration are increased more than cases of non-Fast-Track projects. In this study, through the questionnaire surveys to professionals having actual implementation experiences as a construction manager, owner or general contractor, key success vehicles of Fast-Track are induced.

Key words : Fast-Track, Key Success Vehicles, Design-Build, Success Influencing Factors

1. INTRODUCTION

1.1 Background

In recent years, use of design-build in the public building sector has flourished. Proven design-build success in the private sector is encouraging public owners to utilize this innovative process. [1] Design-build is an alternative project delivery method which encompasses both project design and construction under one contract. One firm, or team, is contracted for a project in its entirety. The forms of entity of design-build contracts is usually created of Joint venture, Limited-liability corporation, A/E-led-constructor subcontractor, Constructor-led-designer subcontractor, Developer-led, and so forth. [2] But the key element is a single source of responsibility for the owner through one contract for both design and construction. There are numerous reasons why owners choose to use design-build, among which the potential for shortened project duration is the primary reason. Through the coordinated efforts between the designers and the builders, construction can begin prior to completion of construction documents. [1]

Even though the Fast-Track approach of design-build was developed in the early 1960s and became a major operational program by 1970, it often led to schedule failures, and project schedule slippage became routine. The major reasons for this failure were the lack of understanding on Fast-Track relationship among engineering, procurement, and construction, and the lack of cooperative environment among project parties. [3]

As aforementioned, the primary reason of applying design-build is the achievement of the potential for shortened project duration. The Fast-Track is able to maximize the possibility of duration reduction. So, the Fast-

Track can be more effective at Design-Build projects requested to reduce the duration.

In this study, key success vehicles of Fast-Track, which are necessary for achieving its goal like shortening project duration, are presented.

1.2 Research methodology

In this study, firstly application objectives and types of Fast-Track in public sector are sought, the environment for Fast-Track is examined, and the concept of successful Fast-Track projects according to project goals is defined through literature study.

Through the questionnaire survey responded by professionals having actual implementation experience as a construction manager, owner or general contractor, success influencing factors for Fast-Track are analyzed. Meanwhile, many characteristics of successful Fast-Track projects are analyzed by literature study, and the characteristics which are directly related to the influencing factor are selected. Also, these characteristics are grouped into five main factors according to degree of relationship. These five factors are translated as 'key success vehicles'.

2. FAST-TRACK IN PUBLIC DESIGN-BUILD PROJECTS

Normally, the clauses for applying Fast-Track are existed at procurement law. But the public agency is in trouble to implement effective Fast-Track because of the lack of the guideline and process for it. As seen in the design-build process of USACE (United States of Army Corps of Engineering), Fast-Track is only executed by design-build entity to suggest it's implementation plan and method

according to design-build RFP (Request For Proposal) in case of owner's needs.[4]

2.1 Objectives and application type of Fast-Track

The objectives of public Fast-Track are different from those of private area. In public sectors, Fast-Track is applied to construction project that is in trouble to complete within the expected duration. Meanwhile, in private sector, Fast-Track is applied to the case that reduced duration can make profits, that is, the project's early completion can be expected to make profits as to reduced duration. Because of these reasons, Fast-Track is applied for a large retail stores like "Walmart" or other commercial buildings.

From the aspect of application type, according to a precedence order of work breakdown structure, detailed design and construction are running simultaneously. A former package is constructed during later package's detailed design.

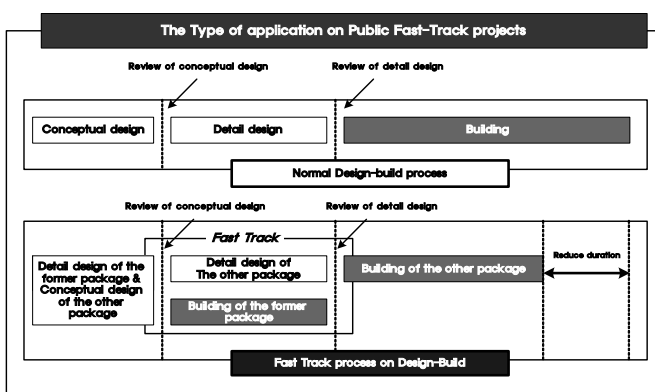


Figure 1. Application type of Fast-Track

2.2 Fast-Track in public Design-Build delivery method

An Implement Process of Fast-Track in public sector does not exist as a regular pattern. According to "Design-Build Instructions for Military Construction (USACE 1994)", at pre-design phase, the owner considers whether the use of Fast-Track is necessary. In this phase, the owner identifies Fast-Track requirements, and the RFP includes these contents. [4] The contractor prepares their documents based on these requirements. Unfortunately the owner has no role during the contractor's preparing Fast-Track. This could cause the problem in implementing Fast-Track owing to the shortness of understanding Fast-Track process & method.

Also, there is a risk that uncertainty of design could cause the serious problem for the following phase. This risk can be reduced by the completely planning at the early stage. In spite of the importance on project planning stage, the current Fast-Track process lacks sufficient speculation at the planning phase.

In case of Joint Venture, sometimes, there is no sufficient coordination and cooperation between designer and builder. This could be a significant problem, because the chance of change orders owing to design error and others grows up more and more, if the design documents do not include the contractor's review. As seen in preceding Fast-Track projects,

the construction of former package without fixed design of later package has risks of the cost increase and construction delay due to change orders. Therefore in the current process of Fast-Track, the lack of contractor's participation at design phase is very risky. Because of these reasons, the construction delay and the cost increase are often occurred by the change orders in design-build Fast-Track projects of public sector.

2.3 Successful Fast-Track Projects in Public DB

There are various studies related to project's success in normal construction work. Sanvido(1992) proposed critical success factors composed of criteria analyzing a side of project's participant. Success criteria were suggested with factors by owner, designer and contractor. Assessment criteria of success are duration, cost, function, result, claim, profits, quality, safety, satisfaction, etc.[5] And the characteristics of successful design-build projects are determined in terms of several criteria; on budget, conforms to user's expectations, on schedule, meets specifications, high quality of workmanship, and minimizes construction aggravation .[6]

In the projects applying Fast-Track, the total cost of project is increased about 10~20%, the total construction duration is cut down about 10~30%.[7] The other side, Fast-Track for public sector is applied to immediate projects of being insufficient duration. Therefore success criteria on Fast-Track projects are different from normal project's one. That is, project's best objective is abided by the day on expected completion. And on public sector's character, profits on private ones are less needed. As a result, the prevention of construction delay is the one of the primary criteria for success in Fast-Track projects.

3. SUCCESS INFLUENCING FACTORS

3.1 Questionnaire for success influencing factors

The critical judgment criterion of Fast-Track's success in public sector is 'on schedule'. Han (2003) suggested factors causing construction delay. Normal construction delay factors are categorized into contractor-responsible reasons and non-responsible reasons. Responsible reasons of contractor include resources, labor, facility, funds, construction method, and management. Non-responsible reasons are resulted from responsibilities of project's other participants.[8] In this study, these factors are rearranged and divided as main groups such as 'project's participants', 'design', 'procurement', and 'construction'. Components related to project's participants are composed of delay of permit and authorization, delay of payment, delay of owner's decision making, delay of prevention and treatment of popular complaints, lack of supervisor's capacity, and weather condition. Components related Design are the delay of change orders, design defects & omissions, uncertainty of work-scope in design documents, lack of communication with other parties. Procurement related components are delay of procurement for resources and materials, and delay of subcontract. Construction related components are unsuitable construction method and process, lack of site

Table 1. Influencing Factors Survey Results

Group	Construction Delaying Factors	Sum of Weights	Mean of Weights	Ranks	Standard Deviation
Project participants & etc.	Delay of permit and authorization	158	6.583	8	2.2897
	Delay of payment	138	5.75	11	2.3318
	Delay of owner’s decision making	168	7	6	1.3844
	Lack of supervisor’s capacity	137	5.708	12	1.8366
	Delay of treatment of popular complaints	175	7.291	2	2.776
	Weather conditions	131	5.458	13	2.7835
Design	Delay of change order	172	7.166	4	2.3033
	Design defects & omissions	214	8.916	1	0.909
	Uncertainty of work scope in design document	149	6.208	10	2.3801
	Lack of communication with each party	172	7.166	4	0.8498
Procurement	Delay of procurement for resources & materials	173	7.208	3	0.9991
	Delay of procurement for subcontractor	114	4.75	15	2.1842
Construction	Unsuitability of construction method	159	6.625	7	0.9973
	Lack of site control	157	6.541	9	1.7073
	Lack of labor control plan	121	5.041	14	2.2817
	Unsuitability of construction equipment	94	3.916	16	1.7539

control, lack of labor control plan, and unsuitable construction equipment.

With these factors, primary construction delay factors in Fast-Track project are pursued. The questionnaire is responded by 24 professionals having actual practical experience as owner, construction manager, or general contractor. As a result of this questionnaire survey, the weight of each construction delay factor is calculated. A rating method is used for developing weight for each factor. For example, the most important factor gets 10 point. On the other hand, the least important factor has 1 point. The results of questionnaire are shown in Table 1.

As known from this survey’s results, the construction delay factors having high weights in Fast-Track project are ‘design defects & omissions’, ‘delay of treatment of popular complaints’, ‘delay of procurement for resources & materials’, ‘delay of change orders’, and ‘lack of communication with other parties’. But, the standard deviations of ‘delay of treatment of popular complaints’ and ‘delay of procurement for resources & materials’ are more than 2 point. This means there are high variations of respondents. Therefore two factors are excluded in this study. Additionally, ‘unsuitability of construction method’ is considered as an influencing factor, because its standard deviation is less than 1. Finally ‘design defects & omissions’, ‘lack of communication with other parties’, ‘delay of procurement for resources & materials’, and ‘unsuitability of

construction method’ are considered as main success influencing factors of Fast-Track.

3.2 Review of existing research on successful Fast-Track projects

There is existing research related to successful Fast-Track projects. “The Effective Management of Fast Track Projects [9]” and “Managing Fast Track Projects; A Guide and Checklist [7]” are analyzed to induce the characteristics of successful Fast-Track Projects. Those are categorized into 4 groups. But, the relevant characteristics with main influencing factors for Fast-Track success are induced as followings.

The characteristics related to ‘Project Participant’ are a good owner’s capacity & organization, experienced project team, good communication system, win/win among project participants, early involvement of designer & contractor, and quick decision making process. Second, those related to ‘Design’ are an integrated team of all parties, holding design information in common, effective process on change order, establishment of design criteria at early stage, interface management, and design process with involving project participants. Third, those related to ‘Procurement’ are selection of long-lead-item, selection of early procurement item, establishment of strategy for standardization items, funding plan, and checking strategy on resource & facility. Finally, those related to ‘Construction Management’ are detailed plan for operating critical path, progress management based on

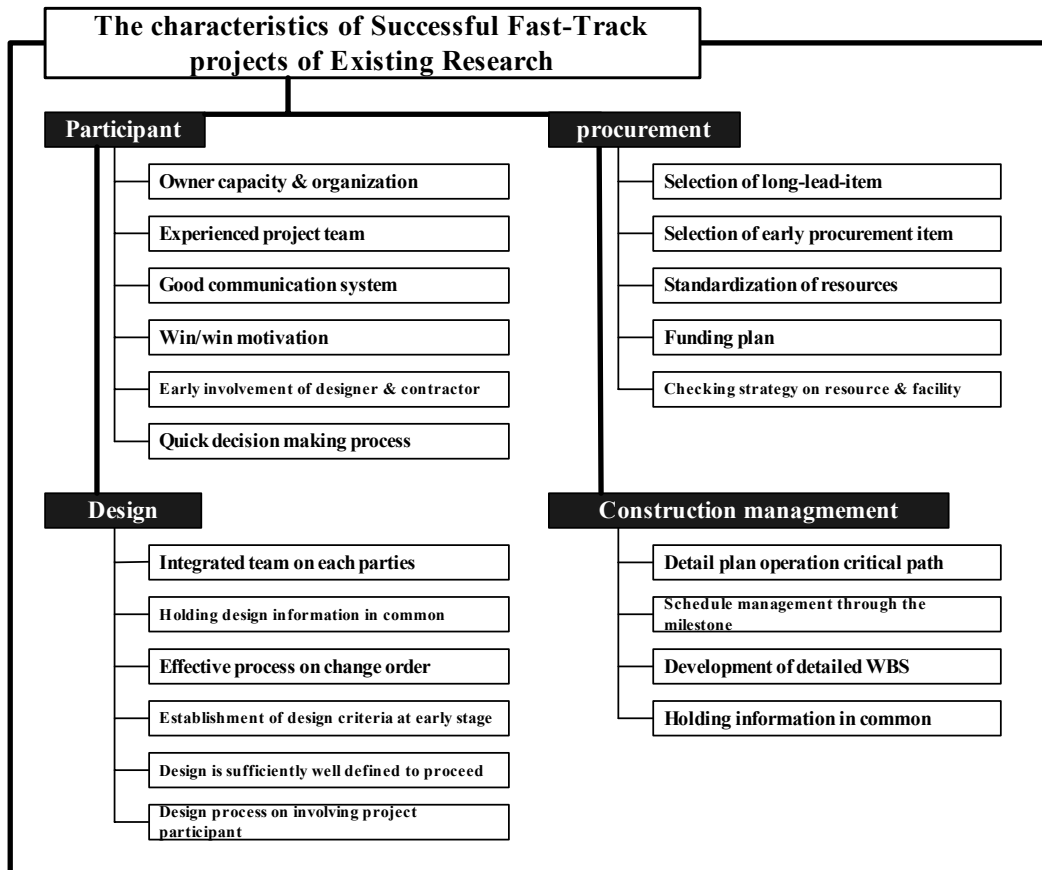


Figure 2. Characteristics of successful Fast-Track projects of existing research

milestone, development of detailed work breakdown structure, residency of designer and supplier, holding information in common, and standardization of construction material. These characteristics are shown in Figure 2.

4. KEY SUCCESS VEHICLES OF FAST-TRACK

According to degree of relationship between the influencing factors and the successful characteristics, the twenty one characteristics could be grouped into five principal factors such as ‘integrated team’, ‘interface management’, ‘constructability review’, ‘definition of design information’, and ‘strategy of procurement’. The results are shown in Figure 3.

In this study, five principal factors extracted through the factor analysis are expressed as ‘key success vehicles’.

The explanations for each success vehicle are follows.

Integrated team: It is important that project participants related to design should organize a united team including owner and contractor prior to design works. For the minimum design error, it is crucial. Also, suppliers and general contractor should build systematic cooperative relationship with the design team. An integrated team should be composed at the starting point of detailed design phase at

the latest. In the Fast-Track’s method starting construction from the design completion part, the problems of detailed design phase could remarkably cause re-construction. Therefore an integrated team needs to be organized before the detailed design phase.

Management of design interface: In order to reduce design defects and omissions, designers of each discipline (architectural, structural, mechanical, electrical, etc.) need to make efforts to reduce error based on common design information. At the time of the review of design interface and constructability, if designer’s opinion is different from contractor’s one, the owner’s control and coordination are necessary. The owner’s immediate decision making is needed because the delay of decision making causes construction delay. If the owner’s capacity is insufficient, it is needed to outsource the construction manager team. To minimize design error, design interface management should become effective before the design of each package is completed.

Constructability review of design documents: Contractors should be involved in all design phases to implement constructability review. For improving constructability, contractors should review the design document based on their know-how and experience, and mediate owner’s and designer’s viewpoint.

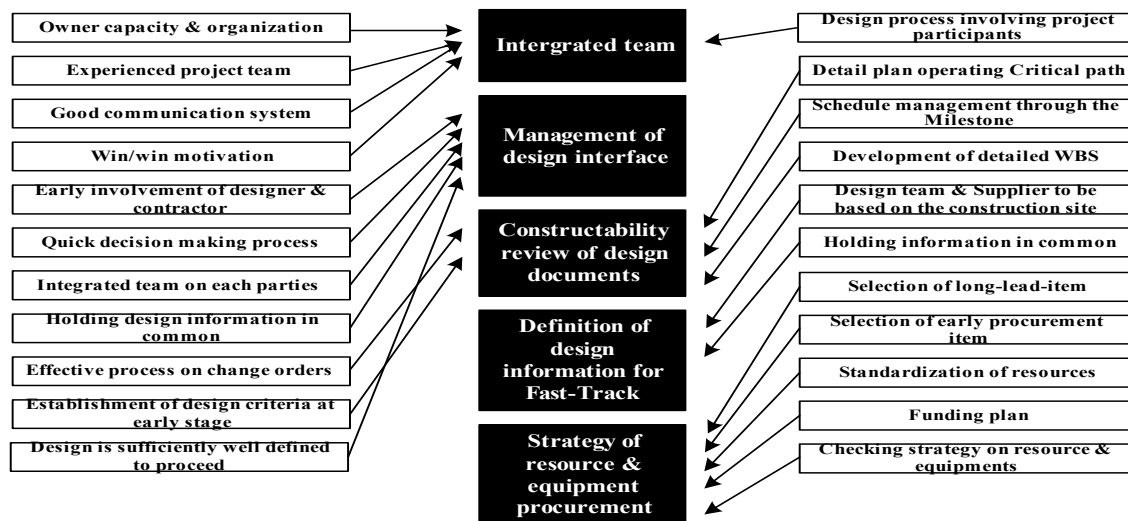


Figure 3. Relationship of successful Characteristics

Definition of Design Information for Fast-Track: In Fast-Track’s procedure, design information for Fast-Track needs to be defined accurately at the early stage. The design scope of each package should be well defined to implement Fast-track smoothly where the design and the construction are being overlapped. Also detailed WBS needs to be developed to each scope. The Fast-Track project’s “Go / No-go” decision for each package depends on this information.

Strategy of resource and equipment procurement: The delay of resources and facility procurement not only cause the construction delay but also lower in quality of final product. Through the procurement of long-lead item at the early stage, it is guaranteed the duration of manufacturing is sufficient. If these items such as the elevator, curtain-wall, equipment, etc. are determined at the early stage, there is less interference with construction works. Because the interference between structure and these items is frequently occurred, suppliers of them need to be involved at the design phase.

6. CONCLUSION

Current status of Fast-Track in public Design-Build projects is speculated in terms of its objectives, application type, implementation environment, and success criteria. The questionnaire survey with experts for analyzing factors influencing Fast-Track’s success was performed. Four influencing factors were extracted; design defects and omissions, lack of communication among involving parties, delay of procurement, and unsuitability of construction method. And many characteristics of successful Fast-Track projects are suggested by other researchers. Among these,

the twenty-one characteristics which are directly related to the influencing factor are selected. Also, these characteristics are grouped into five main factors such as integrated team, interface management of design participants, constructability review, definition of design information, and strategy of procurement. In this study, these five factors are suggested as ‘key success vehicles’.

As known by these results, the good relationship among the participants is the most important factor. So, the cooperation environment improving the relationships may be essential to apply Fast-Track method in Design-Build delivery system.

With the results of this research, factors affecting the success of Fast-Track projects are identified. The information from this research can be of benefit to both the practice and the education of Fast-Track. In practice, the results can help owners, construction managers and general contractors to manage Fast-Track projects.

The studies, hereafter, which are related to the cooperation environment and the guideline for Fast-Track process need to be performed.

7. REFERENCES

- [1] Molenaar, K. R. & Gransberg, D. D., “Design-Builder selection for small highway projects,” *J. Manage. Eng.*, 17(4), 214~223, 2001
- [2] Beard, J. L., Loulalis, M. C. & Wundram, E. C., “Design-Build,” McGraw-Hill, 2001
- [3] Bent, J. A. & Humphreys, K. K., “Effective project

management through applied cost and schedule control,”
Marcel Dekker, Inc., 1996, New York

[4] USACE, “Design-Build Instructions for Military
Construction,” 1994

[5] Sanvido, V. E., & Konchar, M. D., “Selecting
Procurement Delivery Systems,” The Project Delivery
Institute, 1999

[6] Songer A. D. & Molenaar, K. R., “Project characteristics
for successful public-sector Design-Build,” *Journal of
Construction Engineering Management*, 123(1), 34~40,
1997

[7] Jergeas. G., “Management Fast Track Projects: A Guide
and Checklist,” 2000

[8] Han, J. K., “An analysis on delay factors of major tades
in apartment housing projects,” *Journal of Architectural
Institute of Korea*, 19(3), 2003

[9] ECI, “The Effective Management of Fast Track Project,”
2002