

RESEARCH BRIEF

2003/001

Implementing Innovation in Construction Projects

OBJECTIVES

This research project investigated the enabling and inhibiting factors of innovation in Singapore's construction industry. The objectives of the study are to:

- (1) examine how innovation can be successfully implemented in the construction project organization;
- (2) identify the main factors that reduce fragmentation and misalignment of motivation of the project team members;
- (3) identify the different tools and mechanisms that can integrate effectively the construction project organization; and
- (4) identify the key factors that would influence innovation success.

RESEARCH METHOD

To achieve the objectives of the research, a retrospective case study questionnaire (data collection instrument) was designed. Questionnaires were sent to clients, consultants, contractors, subcontractors and suppliers. Respondents were asked to identify innovations in their projects, and to rate various aspects relating to those innovations on a 7-point scale, where 1 represented 'strongly disagree' or 'not interested' or 'least emphasized' and 7 represented 'strongly agree' or 'highly interested' or 'highly emphasized', as the case may be. The study collected data of 58 projects that had adopted innovation in Singapore.

FINDING 1: MANAGING IMPLEMENTATION OF INNOVATION

The study designed and successfully tested a framework on how to manage the implementation of innovation in a construction project organization that comprises many players. Within a project organization, there are two groups of players: the origin organization and supporting organizations. Origin organizations are firms that propose or initiate the innovation; and supporting organizations are stakeholders (other project team members), whose support is needed for the innovation to be successfully implemented. This

study finds that an innovation may be successfully implemented if the following factors are controlled when players are attempting to initiate, implement or support an innovation:

- Objectives or goals are clearly laid out.
- Constraints are minimized.
- Efforts exerted at the management level and project level are maximized.
- Challenges faced at the management and project levels are minimized.
- Project team members are highly interested in the innovation when it is first proposed and when it is being implemented.

FINDING 2: REDUCING FRAGMENTATION AND MISALIGNMENT OF MOTIVATION OF TEAM MEMBERS

The results show that motivation among firms in the construction project organization will be more aligned under the following situations:

- Parties that are involved in innovation cooperate with each other and have team spirit, improve their managerial and technical capabilities and educate and persuade employees to adopt and implement innovation.
- Separate task groups to implement the innovation are formed.
- Contractual relationships are favourable.
- Constraints that impede innovation are removed from contractual agreements.

Firms in a construction project organization will be more integrated when the following conditions are met:

- Parties that are involved in innovation have team spirit, improve their managerial and technical capabilities, educate and persuade employees to adopt and implement innovation and work towards the goal of improving the performance of the whole project.
- Separate task groups to initiate and implement the innovation are formed. These task groups should have monitoring plans to track innovation initiation progress, have coordination and monitoring mechanisms to track innovation implementation and formulate coordination plans with all relevant parties.

- Constraints that impede innovation are removed from contractual agreements.
- A flexible project schedule for the innovation to be worked on is provided.

FINDING 3: TOOLS AND MECHANISMS FOR INTEGRATION

To achieve integration the following tools are found to be effective:

- Clients to formulate a goal to increase the performance of the whole project.
- Firms to improve their own managerial and technical capabilities.
- A separate task group to plan, initiate and implement the innovation is formed.
- Employees are prepared for the change brought about by the innovation.
- Team members who have good working relationships are chosen.
- Less restrictive and more balanced contractual agreements are used.

FINDING 4: KEY FACTORS THAT INFLUENCE INNOVATION SUCCESS

Regression analysis produced two robust models to predict the benefit of innovation to project participants (Y1) and benefit of innovation to the whole project (Y2). The regression coefficients are $R^2 = 0.81$ and $R^2 = 0.67$ for Y1 and Y2 respectively. The formula to predict Y1 and Y2 are given below.

$$Y1 = 1.952 + 0.43 (SO2-PLC) + 0.342 (PLE3) - 0.153 (CNST5)$$

$$Y2 = 2.661 + 0.356 (EG7) - 0.276 (PLCH3) + 0.344 (PLE3)$$

Where:

- Y1 is benefit of innovation to project participants and Y2 is benefit to the whole project, given on a 7-point scale, where 1 = no benefit and 7 = maximum benefit.
- SO2-PLC is the interest level of the main consultant when the innovation is being implemented, measured on a 7-point scale, where 1 = not interested and 7 = highly interested.
- PLE3 is the extent to which coordination mechanisms are established at project level to implement/support the innovation, measured on a 7-point scale, where 1 = least emphasized and 7 = highly emphasized.
- CNST5 is the extent of managerial capability to implement the innovation, where 1 = very strong capability and 7 = very weak capability.
- EG7 is the extent to which the purpose of the innovation is to enhance the performance of the whole project, measured on a 7-point scale, where 1 = not applicable and 7 = highly applicable.
- PLCH3 is the extent to which the schedule of activities could allow the innovation to be worked on at the project level, measured on a 7-point scale, where 1 = highly flexible and 7 not at all flexible.

CONCLUSION

The data were used to successfully validate models which were designed to explain and manage the implementation of innovation in a construction project organization. The construction innovation implementation framework designed in this study may be used to help owners, consultants and contractors initiate and implement innovation. The advantage of this framework is that the overall effect of the innovation process in a construction project organization is known. This model can be used to design strategies to initiate and implement innovation in a construction project.

This study found that for innovation to be successful, a champion is needed to lead a task force or working group at the initiation and implementation stages. The working group should monitor, coordinate and track the implementation of the innovation.

An innovation is more likely to be successfully implemented if the client is the origin organisation or a very encouraging supporting organisation. The main consultant also plays a very important part in the innovation process. These two parties have such important roles in construction innovation because of their powerful positions in a project.

The findings in this study will help owners, consultants and contractors predict what will be the likely success level of an innovation and how much the project will benefit from the innovation. In addition, firms can go about managing the significant factors that can bring about greater alignment of motivation and integration, to ensure innovation success.

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