Thesis Abstract

(1) Name

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(2) Thesis Title

A study of Technological Management of National Projects Focusing on Value Transmission

(3) Thesis Summary

The purpose of this thesis is to avoid repeating failures and to ensure mission success of national projects by analyzing problems and background factors of failures in national projects of the space development program, and by proposing project improvement strategies.

This thesis focuses on the difficulty of practical application of systems engineering in Japan, which is useful for large-scale and unique development projects and the ambiguous value of national projects.

Firstly, the result of cultural position analysis in communication indicates that Japan is a high-context culture, which creates a possible barrier for document-based technology management. It has also been suggested that a product development process established by a Japanese automobile company may be helpful in suitable technological management in Japan because the process is characterized by integration-based methods and focuses on value.

Secondly, the value structure of national projects is visualized using a value chain, which points out critical transitions from agency to company after contractor selection. In system development, engineers not only transmit requirements through documents, but they also share value between each system. On the other hand, cases of intervention by higher-level engineers in lower design activities are possible and may impede effective design activities. This is due to a kind of principal-agent relationship between higher- and lower-level engineers that is caused by asymmetric information concerning value and the design technology. To discuss potential problems caused by ambiguous values, a value transmission process in system development is visualized, and value transmission failures and their influence on the total process are considered theoretically and through quantitative simulations.

Finally, the following effective frameworks that support and complement technological management have been developed:

i) Risk visualization framework of breaks in the value chain: To visualize risks and background factors, a VPRAB (Value-Process-Risk-Action-Background) framework is proposed and the application results concerning space development are provided.

ii) Value transmission framework: To transmit and share value consistently from top to bottom and to apply the value to the decision-making process, “Value Sharing with Evidence Supporting Requirements,” “Concentrated Value Transmission by Co-location,” and “Value Breakdown Sheet” are proposed. In addition, preliminary tests suggest the effectiveness of the framework and found that the combination and balance of “technological management-value- communication” is important.