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From Theory to Practice: Toward a Typology of Project-Management Style

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Concepts

In this paper, the author, Aaron J. Shenhar, tried to match the project management and organizational style with the specific project type. He classified the project type by using two criteria—the technical uncertainty, and the system scope. In technological uncertainty criteria, he classified the project by concerning about the level of technological uncertainty—low, medium, high, and super high. In the scope system criteria, he classified the project according to the level of hierarchical scale—assembly, system, and array. These two criteria were combine into a two-dimensional theoretical model for the classification of technical project. Shenhar believed that each type of projects should have it own management style. He also believed that a proper project classification prior to the project initiation and carefully selected management style might lead to better implementation and to an increased chance of project success. Mismatching between a project and a project management style could lead a project to fail.

In his study, Shenhar used a multiple case study approach to gather the data. Then he used a combination of qualitative and quantitative method to analyze the data to find out the result of his study.

Methodology

The methodologies that were used in this study were a multiple case study approach to gather the data. Then a combination of qualitative and quantitative method was used to analyze the data. Shenhar fit the methodologies into the life cycle of his study. He classified the life cycle of his study into data sources' period, data collection period, and data analysis period.

In the data sources' period, many projects were evaluated for study. Shenhar tried to select the wide variety of projects from the various organizations. To represent projects in general, he selected 26 projects from electronics, computer, mechanics, aerospace, chemicals, and construction industry in the various sizes and project duration.

In the data collection period, the methodologies that were used were perusal of project documents and archives, interviews, questionnaires, and observations. 115 project members

from project management teams, functional teams and customer representatives were interviewed by groups of two or three researchers. In addition, field investigators—graduate students in management and technology— received at least 20-hour- in-class training, and were sent to investigate and observe a project management style of the selected project.

In the data analysis period, a cross-case comparative analysis was used to analyze the qualitative data. The Two-Dimensional Model –Technology Uncertainty, and System scope was used to summarize the result.

Contribution to the literature

In this paper, the author did a lot of research. He concluded that the literature on how projects are managed was quite insufficient. He found that most texts and handbooks on the management of projects are too general. They did not distinguish among different kinds of projects with different strategic and operational problems. Therefore the actual process of managing different kinds of projects still remains unclear and is probably less well understood.

According to the weakness in literature on the management of the project, this paper tremendously contributes to the literature and the public sector. The result of this paper is very useful because a management team can adapt its information and use it to do an efficient job. A management team can allocate the resources to a project appropriately because they already know, from the result of this paper, that different types of projects need different kinds of resources. For example, a high uncertainty project needs a project manager who has a stronger technical skill than a low uncertainty project. In addition, the result of this paper helps a project manager choose the management style appropriate to a project. (See Exhibit 1 and 2)

Shenhar characterized the result into two main groups. The first group was a quantitative result that was divided into project resources, project outcome, and management. The second group was the summary of project contingencies and trends.

The quantitative result showed that the project resources—budget, length, and number of people employed were not significantly affected by the technological uncertainty but were affected by increases in the system scope. On the other hand, the percentage of academic degree holders that was increased according to the increases of technical uncertainty was not affected by the system scope (See Exhibit 3).

The project outcome—new market, new technology, and new product line— was mainly influenced by technological uncertainty. The project with higher uncertainty resulted in new market, new technology, and new product line when compare to projects with lower uncertainty (See Exhibit 4).

In management, the higher technological uncertainty generated the larger number of design cycles, the later event of design freeze, and the greater number of milestones. While, the work breakdown structure utilization, the computerized planning, and the number of milestones were affected by system scope (See Exhibit 5).

In the summary of project contingencies and trends, the first trend concerned project contingencies along the technological uncertainty dimension. As uncertainty increased, the extent of development and testing activities, the number of technical skills employed, and the

communication increased progressively. In this situation, a management team should manage the project with increased flexibility and a tolerance toward change.

The second trend concerned project contingencies along the system scope dimension. The increasing of the system scope with constant uncertainty resulted in additional concerns for the formal administrative issues—more planning, tighter control, more subcontracting, increased bureaucracy, and more documentation.

The last trend was the combination of both dimensions. In the high uncertainty and high scope project, the management team should concern about the system engineering, the system integration, configuration management, and risk management. The management should incorporate the tools of system engineering to harmonize an ensemble of subsystems and components optimally. They should concern that the higher level of uncertainty, the more complex of system integration—long and tedious process of assembly, numerous testing cycles and necessary tradeoffs. The special software is needed in the high uncertainty and scope project to track all of the decisions and changes and to identify the potential interactions that would occur with each change. In addition, the management should consider that the higher scope and the higher uncertainty project, the more sensitive to the problem of risk management and the higher need for systematic risk analysis (See Exhibit 6).

Comparison with other research publications

There is a research that was conducted by Khaled A. Bubshait and Willem J. Selen about the project characteristics that influence the implementation of project management techniques: A Survey. Bubshait concluded from his study that one of the reason for project failure is that management techniques applied to a project may not always suit the project's requirements or project characteristics. The results indicate a positive relationship between the number of project management techniques used and the level of complexity involved in the project. Project with many activities usually implies more (precedence) interrelationships and more multi-organizational involvement in the decision process. As such, additional project management techniques are required to support the management process [1]. Project management techniques that Bubshait mentioned were Planning Techniques—WBS, Gantt chart, milestone, PERT, CPM, etc.—and Control techniques—Progress measure, PERT/COST, Trend analysis, etc.

The research of Shenhar supports the research of Bubshait. Shenhar also concluded form his study that the big system scope project, the project with many activities, requires more planning, tighter control, more subcontracting, and increased bureaucracy.

Jose Maria Vila did a research about the reflections on a complex project. Vila concluded that managers planning a complex project can use traditional project management techniques for some aspects of the project, but they should not try to gain complete control of the project using those methods. It is best to be flexible and try to combines several different techniques in new ways. In addition, the more complex a project, the more specialization it requires [5].

Shenhar also concluded his study in the same way. Shenhar stated that the management style of the high uncertainty project, the complexibility project, should have the flexibility and tolerance toward change. In addition, the higher the uncertainty, the more technical skills employed.

The difference among this paper and other researchers' works is, in this paper; Shenhar used two-dimensional model, the combination of technical uncertainty and system scope, for project classification. Then, he matched the project management trends along the dimension of technical uncertainty and system scope. While, the other researchers worked on one dimension either system scope or technical uncertainty (project complexity). Therefore the matching between management styles and project types form Shenhar's study is more specific into the project types than the results from other researchers' works.

Strengths of this paper

Shenhar had the strong concept in this paper. His expected outcome was the matching between project management styles and specific project types. The outcome from this paper would be useful and contribute to the literature in project management area. He spent a lot of efforts to explain the concept of this paper clearly in detail. It was not too difficult to anybody in the field to understand and adapt it to practice.

The methodologies that he used were appropriate. Shenhar used a wide variety of studied projects from a variety of industries so that his study covered a project in the industry. The data used in this study was collected by reliable people. He used a lot of methods to gather the data such as the perusal of project documents and archives, interviews, questionnaires, and observation. A variety of data collecting methods used brought him the reliable data.

Shenhar used the Two-Dimensional Model to classify the project. It was an appropriate model used to classify projects base on technical uncertainty and system scope. The result from this model was the classified projects that were more specific in project characteristics.

The result form this study is very useful in project management area. Shenhar classified the results into quantitative and theoretical trends. Both of them complement each other. Shenhar explained the results clearly by showing the descriptive statistic of the quantitative variables. His explanations help people to understand the result more easily.

Weaknesses of this paper

We could see from the quantitative results that the standard deviation of almost all variables was quite high. The high standard deviation of the variables meant that the results might not consistency enough. This non-consistency might occur because of the small number of samples. In his study, Shenhar tried to choose the various types of studied projects to

represent the project in general. However, the number of studied project was quite small which effect to the small number of project studied in each category (See Exhibit 7).

Some results in this study might not be practical in reality. For example, the result showed that the number of design cycles decreased with the increasing of system scope. In reality, the number of design cycle should increase with the increasing of system scope. This problem might occur because of the small number of studied project as well. The higher scope projects in this study might have lower uncertainty than those of lower scope.

In conclusion, I would like to state that the weakness of Shenhar's study is using the small number of studied projects. Therefore, when he classified the studied project into the specific project type by using the Two-Dimensional Model, the number of projects in each category were quite small. In some categories, they did not have any studied project (See Exhibit 7). It was hard to say that the studied projects in Shenhar's study were reasonably representative of projects in general.

Conclusions of this paper

Shenhar stated that his research was only one step in the lengthy process of building a project-management theory. The purpose of his study was to construct a conceptual model of technical project and to use this model as a framework for insights into the managerial differences that exist among various types of engineering project. Shenhar concluded his study by suggesting a managerial implication. He suggested how the result from his Two-Dimensional model works in practice. He stated that management and organizations should adopt a more project-specific approach to the management of projects. First of all, the project should be identified and classified into project type. Then, project management style should be chosen to match with that type of project (See Exhibit 8).

Since different projects are associated with various levels of risks, organizations may use Shenhar's concepts to weigh risk and opportunities, and adopt a proper project-management strategy to deal with those risks.

The results from this paper may also be used to identify technical-skill development needs, managerial development, and management training. Moving into different types of projects requires an adoption of different styles and the development of additional skills. Understanding the strategic and the operational difference between projects may help avoid potential errors.

Shenhar also warned that very few projects were indeed the super-high technical uncertainty project. Categorizing a project as super-high technical uncertainty, when it is actually a high technical uncertainty may prove detrimental to initiative and very costly. Shenhar also emphasized that an incorrect project categorization would lead to an incorrect matching with project management style and would lead to the project failure afterward.

Adequacy of references

Shenhar did a lot of research in project management area. He concluded that the literatures in management of project are quite general. Such literatures do not distinguish among different kinds of projects with different strategic and operational problem. However, in this paper, Shenhar used 74 references. All of them were used appropriately to support his study. The 74 references were adequate for this study.

Recommendation

This study of Shenhar is one important step in a development of management of projects. The results of his study gave the clear direction to the project management teams to manage their projects. From now on, project management teams will know what an appropriate management style should be used with each specific project type. However, this study still had some weaknesses. The sample size was rather small to represent projects in general. In the future study, Shenhar might have to strengthen his study by adding more samples.

For future work, I would like to see more detail about how to classified a project into the Two-Dimensional Model. A project classification by criteria might be used in this case. For example, in system scope dimension, the criteria should be used to classify a project are project duration, project total cost, number of activities, number of employees involved, etc. For each project, after we give the score to each criterion and know the total score, we can classify it into system scope dimension. The same method but different criteria should be used in the technical uncertainty dimension as well. In addition, we might assign weight fraction to each criterion if their levels of importance are different.

The external uncertainties have a big effect to a project management style as well. For example, a lot of international projects are dealing with the culture problem. Some of them are dealing with the economic crisis in Asia. Some of them are dealing with the government regulations. All of those external uncertainties should be considered together with the technical uncertainty while matching a project management style with a project type.

Shenhar also concluded in this paper that further research also is needed to explore additional role of contingencies in project management and their interaction. It is needed to test the concept of fit between project effectiveness and structural, as well as other governance parameters. In addition, different dimensions of project classification may be considered. Further contingency studies may also investigate various functional activities in project such as marketing, quality management, and contracting and contract type, as well as risk management, documentation, communication channels, and human resources management.

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Exhibit 1

Project management style in technical uncertainty project

	Low Technical Uncertainty	Medium Technical Uncertainty	High Technical Uncertainty	Super-High Technical Uncertainty
Project Type	Construction	Industrial	New product development	New technology development
- Old technology	100%	> 50%	< 50%	0%
- New technology	0%	< 50%	> 50%	100%
Competitive advantage	No	No	Yes	Yes
Competitor involvement	No	Yes	Yes	Yes
Project manager	Administrator	Administrative and Technical skills	Administrative and Technical skills	Well respected Technology leader
Management style	Firm, Rigid, Formal	Moderately firm	Flexible	Highly flexible
Communication - Style	Formal	Formal and Informal	Formal and Informal opened communication	Formal and Informal opened communication
- Frequency	Low	More intense	Highly intense	Highly intense
Team member	Semi Skilled personnel with experience builder	Educated	Highly educated and qualified professional	Highly educated and qualified professional

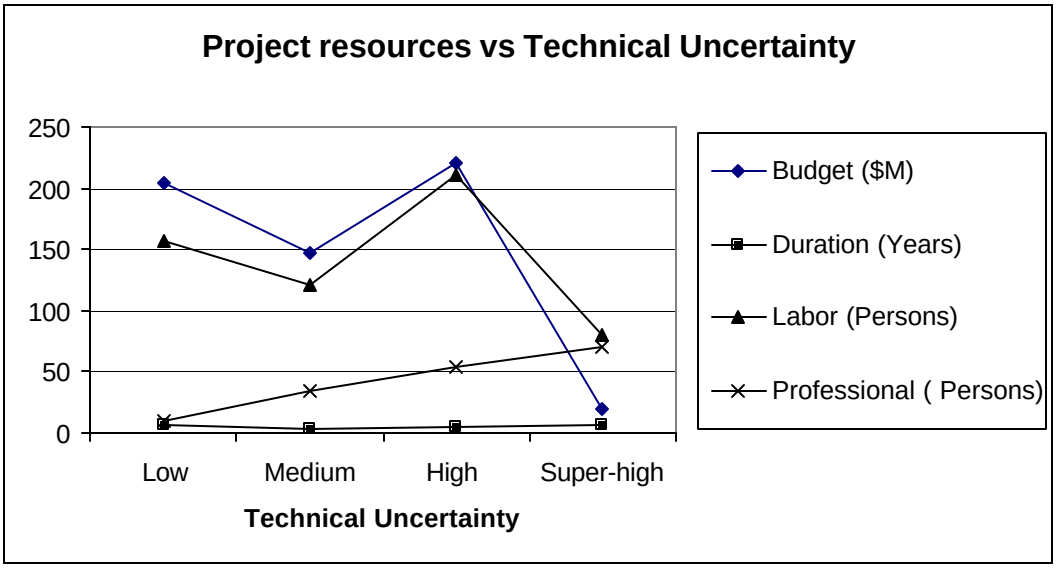
Source: Adapt from Aaron J. Shenhar, From theory to Practice, Toward a Typology of Project-Management Style IEEE Transaction in Engineering Management, Feb. 1998, v. 45, pp. 33-48.

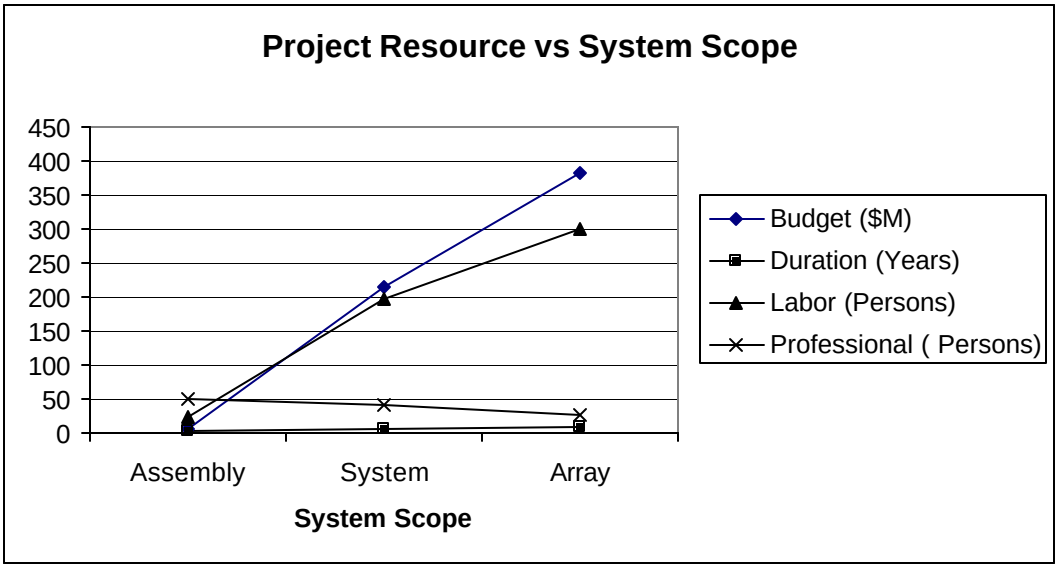
Exhibit 2
Project management style VS system scope

	Assembly	System	Array
Project	Single component/ Complete assembly	A collection of interactive element functioning together with in single product	A dispersed collection of systems
Planning of budget and schedule	Relative simple	Detailed software planning package	Depend upon each system
Communication pattern	Informal	formal	Highly formal
Management style	In-house informal	Formal main/ subcontractor relationship	Remote and highly normal

Source: Adapt from Aaron J. Shenhar, From theory to Practice, Toward a Typology of Project-Management Style IEEE Transaction in Engineering Management, Feb. 1998, v. 45, pp. 33-48.

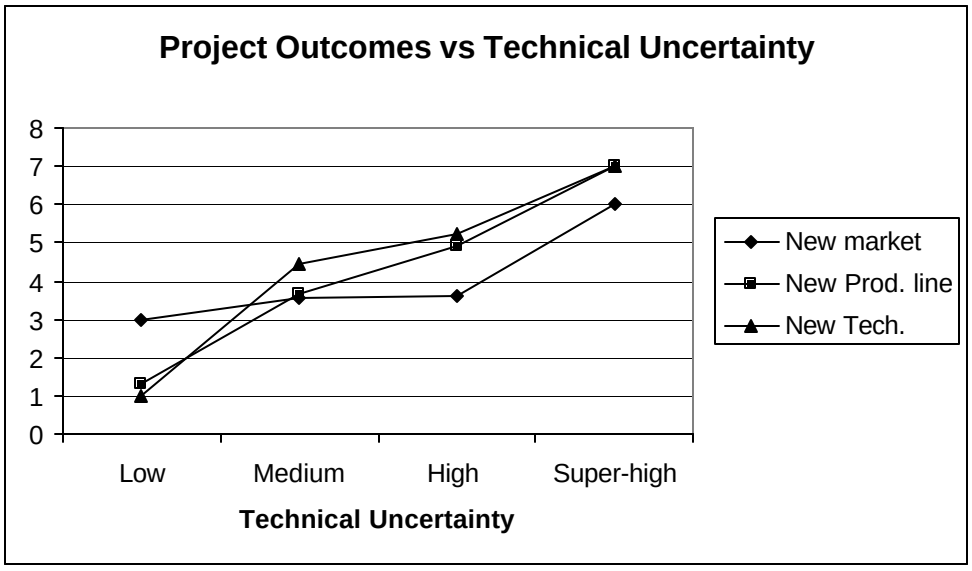
Exhibit 3
Project resources trends

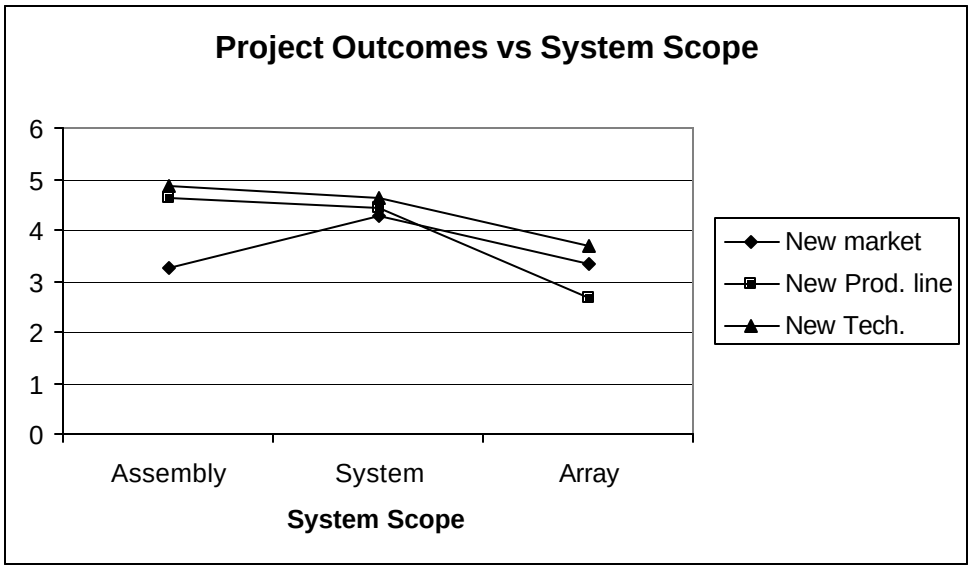




Source: Adapt from Aaron J. Shenhar, From theory to Practice, Toward a Typology of Project-Management Style IEEE Transaction in Engineering Management, Feb. 1998, v. 45, pp. 33-48.

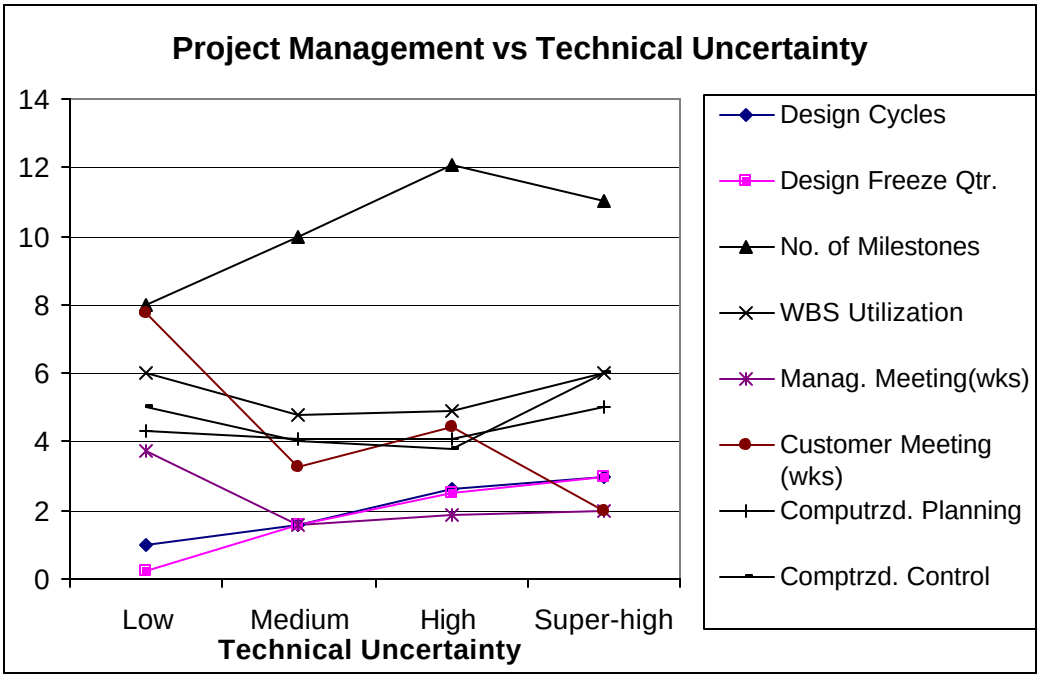
Exhibit 4
Project Outcome trends

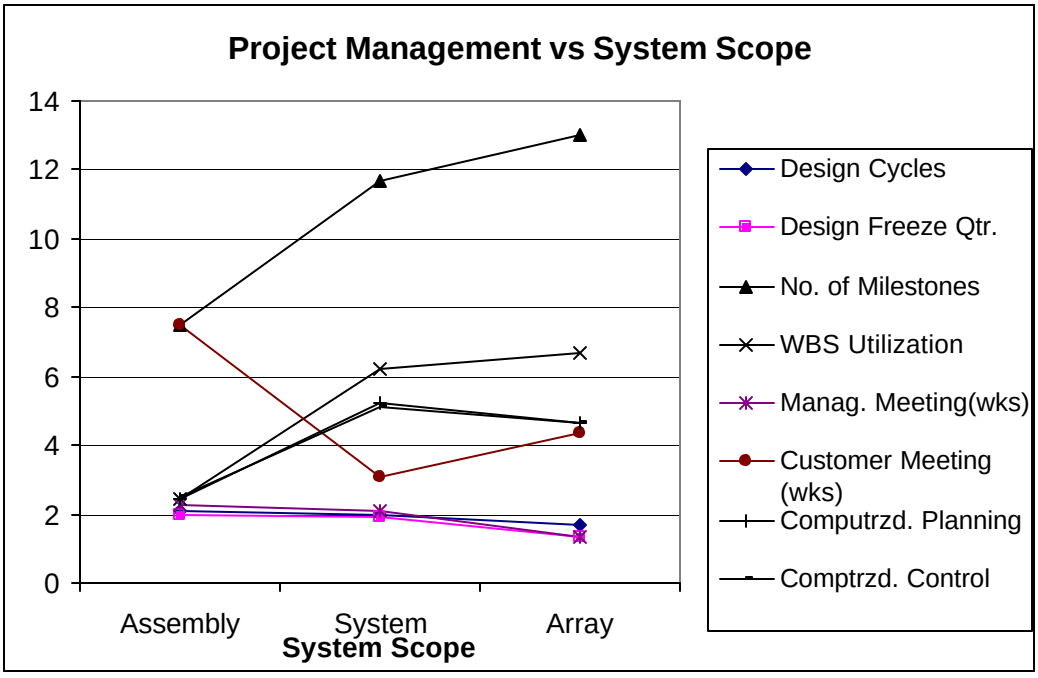




Source: Adapt from Aaron J. Shenhar, From theory to Practice, Toward a Typology of Project-Management Style
IEEE Transaction in Engineering Management, Feb. 1998, v. 45, pp. 33-48.

Exhibit 5
Project management trends

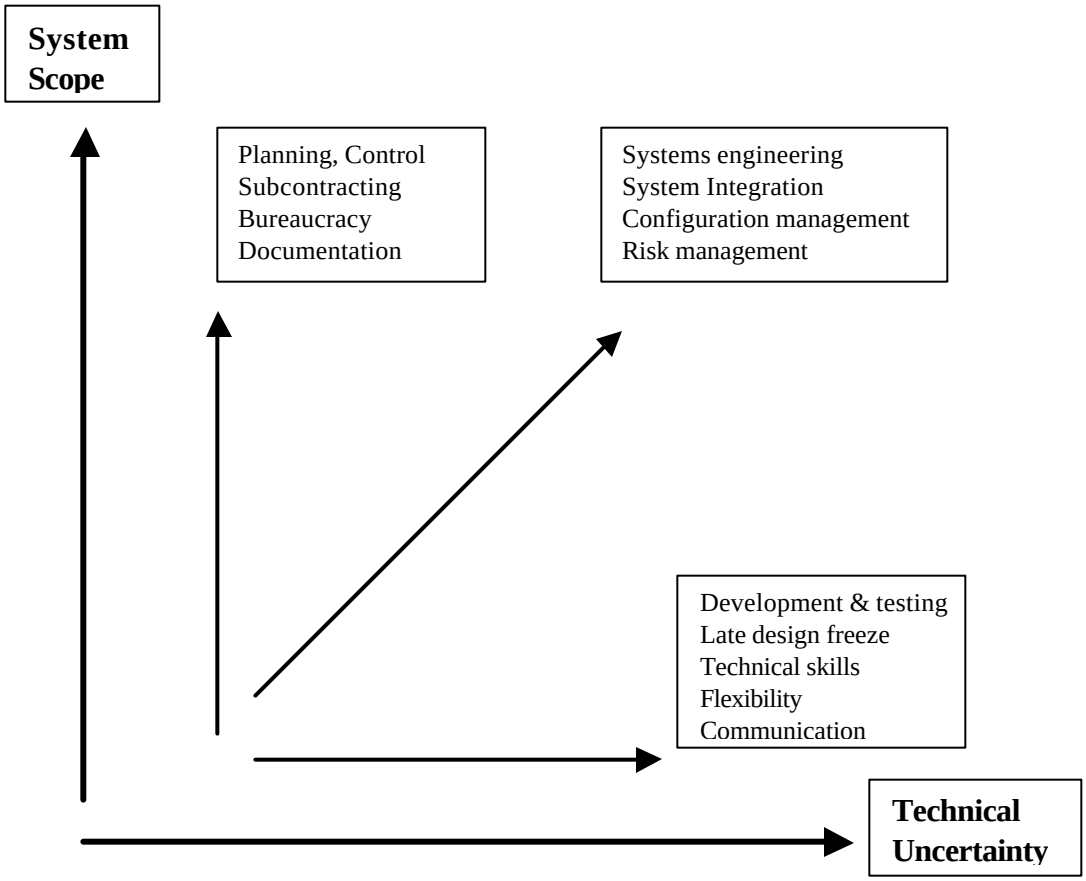




Source: Adapt from Aaron J. Shenhar, From theory to Practice, Toward a Typology of Project-Management Style IEEE Transaction in Engineering Management, Feb. 1998, v. 45, pp. 33-48.

Exhibit 6

Project-management trends along the dimensions of uncertainty and scope



Source: Aaron J. Shenhar, From theory to Practice, Toward a Typology of Project-Management Style IEEE Transaction in Engineering Management, Feb. 1998, v. 45, pp. 33-48.

Exhibit 7

The number of studied project in each category

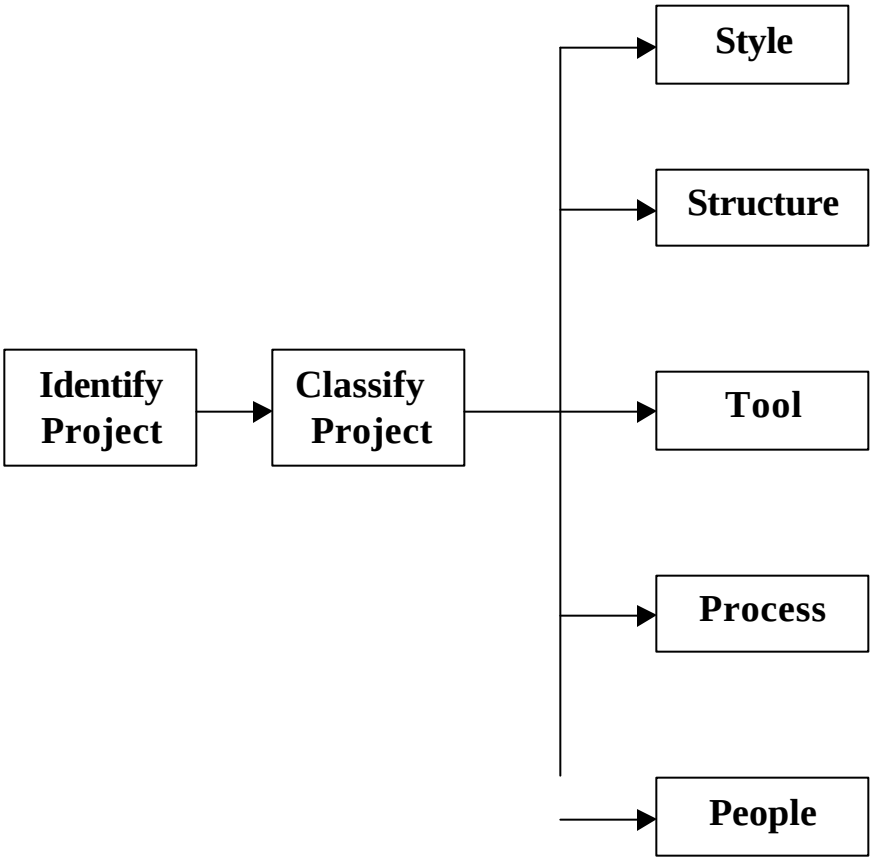
Project type	Number of studied project
A1	0
A2	3
A3	1
B1	3
B2	4
B3	2
C1	4
C2	6
C3	0
D1	1
D2	2
D3	0

Technical Uncertainty
A: Low Technical Uncertainty
B: Medium Technical Uncertainty
C: High Technical Uncertainty
D: Super-high Technical Uncertainty

System Scope
1: Assembly
2: System
3: Array

Source: Aaron J. Shenhar, From theory to Practice, Toward a Typology of Project-Management Style IEEE Transaction in Engineering Management, Feb. 1998, v. 45, pp. 33-48.

Exhibit 8
Adapting project management to project type.



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