A Research on Organization Form of Enterprise Agile R&D

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Abstract. Agile research and development which aims at catering for constantly changing, uncertain and unpredictable markets by shortened R&D cycle, high speed and low cost, which is a new paradigm for an enterprise organization, corresponding with the new economic condition. With the core competency of enterprise R&D, it implements self-regulation promptly, integrates external and internal R&D resources rapidly and uses agile R&D tools widely. The organization form of enterprise agile R&D is typically flattening, miniature, decentralized, flexible and networked. Based on the resource integration method of agile R&D, this paper designs a general framework for agile R&D organization to achieve the two goals of R&D quantity and quality.

Introduction

“Agile development”, the abbreviation of “agile software development”, refers to a man-centered, iterative and gradual development method of software product. Its operating principles are: firstly, divide a software project into multiple independent sub-projects well integrated and performed; then, develop and test the sub-projects respectively and independently; finally, integrate the successfully developed sub-projects systematically into a complete software. By fully applying system and integration theories, this development mode divides a complicated software product system into several independent subsystems, develops them respectively and finally integrates them systematically. On the one hand, it reduces the complexity of system development and saves development time; on the other hand, it improves the modularity of software development in favor of module reuse and avoids repeated development to reduce time and cost of development.

Under the new economy, an agile organization is more survivable and competitive than a traditional organization. The agile organization can learn about all kinds of changes outside the enterprise faster and implement the integration and optimization of external and internal resources of the enterprise, the organizational structural optimization, the business process re-engineering and the innovation of technology and product at the fastest pace, meeting the demand of prompt response to external environment. In this way, the enterprise is able to produce and operate a new product and follow up the market faster than other competitors. Therefore, the agile organization has become a research focus of attention.
Organization Mode of Enterprise Agile Research and Development

Thomke thought that the flattening shape, miniature scale, decentralized structure, flexible property and networked form of an organization are what agile development mode for mass customized product requires of organization management. Based on these five requirements, the enterprise, in mass customized production manner, on the one hand, should internally carry on the agile development of product through trans-department multi-functional and learning work groups and atomistic, flexible and networked informative organizations [1]. On the other hand, the method of virtual enterprise should be adopted between enterprises to deal with the challenges of time and cost about which mass customized production brings by business outsourcing, joint venture and strategic alliances. Thus, both personalized and variable market demand with which the mass customized production is confronted and the demand of increasingly shortened product delivery time can be met.

Huang and Hou, in the respect of enterprise R&D mode research in the agile manufacturing environment, divided traditional R&D organization management mode into three types: centralized R&D management mode, decentralized and hybrid ones[2]. They thought that those three kinds of modes cannot meet what agile manufacturing requires of the enterprise R&D organization. Thus, they put forward three R&D management modes: the parallel R&D management mode, the virtual one and the fractal one. The construction of the enterprise R&D organization management mode based on fractal theory should follow the principle of multi-layers, unsteadily constructive, independent and non-profit information sharing of system organization structure and the principle of publicity, fairness and reasonableness, which can realize the specialization division of R&D system, make full use of the limited R&D resources of the enterprise and invigorate the R&D system of the enterprise. They thought that the characteristics of these three kinds of modes can meet the requirements of the enterprise R&D organization better in the agile manufacturing environment.

Wang et al. in the respect of product development mode research based on collaborative product design chain management, put forward the product development organization of collaborative product design chain management [3]. Research findings are as follows: they studied the connotation of collaborative product design chain; the design chain is an open, equal, shared, dynamic and networked innovative organization; the design chain is a contractual consortium for mutual tasks; the design chain is a multilateral cooperative organization based on communication and computer networking technology. The roles of members of the design chain are defined as manufacturers, upstream and downstream suppliers and clients. The product development mode is characterized by openness, flexibility, dynamic, resource and information sharing and coordination between members in the organization.

Bullinger et al. put forward five links of rapid product development mode which mean the conception, design, prototype manufacture, test and assessment of the plan and they systematically analyzed the unique contents for each link [4].

Zuo et al. in the respect of new product development mode research of dynamic projects, according to the multi-products and multi-standards progress, designed a two-stage mode in the process of product development, put forward the new product development organization of dynamic project with planning, management and technique teams as three component factors and also pointed out that the planning team is a relatively independent team and there is a close relationship of superior-subordinate management and implementation, between management and technique teams[5].

Thomke and Reinertsen, in the respect of product development management research in uncertain environments, carried out the theoretical and empirical research on flexibility
development management in uncertain environments [6]. Theoretically, they put forward that the development technique of flexible product, management method and modularized product structure guarantee the flexibility development so that the research and development of agile product can be realized. Empirically, they found that in efficiency, flexibility development technique outweighs the rigidity development technique, whose difference results from the difference in the risk management of development. Good flexibility makes developers able to handle high-level risks.

Yi et al. discussed and did a theoretical and empirical research on the effect which organizational flexibility exerts on the new product development [7]. Research has found that there is a positive relationship between product development capability and cooperative flexibility of organization operation while the relationship between product development capability and organization resource flexibility is reversed U-shaped. The study by Song and Zhou suggested that organizational flexibility has great impact on the degree of self-innovation of an enterprise [8].

From the analysis above, researches on agile organization focus on the capability of organization at present. Researches on the construction, management and computing modeling of the organization will provide reference for the research on agile R&D organization mode when combing the changes like the change of current information environment.

Construction and Reconstruction of Agile Organization

Speed Structure of Enterprise Research and Development

Agility requires two things of the organization structure. One is flexible organization management which means that the organization is able to adapt to changes of environment through prompt self-adjustment. Flexible organization management has something to do with the flattening and miniaturization of an organization for these two features reducing management hierarchy and improve the organization decision-making speed, becoming a vital way to realize organizational flexibility. The other one is modularized organizational unit. In order to adjust to changes of environment, deal with challenges and meet diversified demand better, rapid recombination of the organization structure should be conducted. In other words, modularization is an effective way to realize rapid organizational recombination.

The implementation of enterprise agile R&D aims at speeding up the R&D so as to meet the requirement of enterprise speed-based competition, whose effect is embodied in two aspects: the shortening of R&D cycle and the pioneer advantage the enterprise gains in product market. As shown in Figure 1.

![Figure 1. Speed of Enterprise R&D.](image)
Resource Integration of Enterprise Agile Research and Development

Resource Integration of Enterprise Research and Development. Based on the economic scale of integrated resources, when companies have their own advanced unique equipment, experimental base, experts in relevant field of technology, the leading technology of some product and a profound culture of innovation, the more resources they own (stocks) in certain areas, the lower marginal incremental cost of resources they will receive, making it easier to integrate more resources. Thus, companies can realize the prerequisites of resource integration: In its need to integrate resources (at least some of the resources) already have some inherent advantages.

Derivative Resource Integration of Enterprise Research and Development. With its resource endowment, along with ongoing research and development activities, enterprises can realize the integration of derivation resources, making it become the connotation of resource integration. Thus, to achieve integrated resources, the enterprise must meet another precondition, that is, making resource endowment attractive. Compared with resource endowment, derivative resources have more recessive trait, and is to better meet the needs of high-level R&D enterprise.

The Integration of Diffusion Resources. The results of enterprise R&D are an accumulation and precipitation of internal resources. It shows the capacity and advantages of the internal resource, that has a strong load bearing and expressive character. Since the carrier of external resources are integrated in the enterprise resource system, it is expected to update and refine the results of research and development have the absorption for enterprise external resources. As shown in Table 1.

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Resource requirements</th>
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<tbody>
<tr>
<td>Consultation Resources</td>
<td>Strategic foresight; Strategic planning</td>
</tr>
<tr>
<td>Technical Resources</td>
<td>Universities, research institutes, technical resources from other strategic partners</td>
</tr>
<tr>
<td>Human Resources</td>
<td>Strategic human resources like full-developed talents , technological innovation talents, marketing talents and international talents</td>
</tr>
<tr>
<td>Supplier and Customer Resources</td>
<td>Information approach, team spirit, and brand loyalty</td>
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Design of Agile Organization

Principles of the Design of Agile Organization

When an agile organization is designed, the primary principle is RRS principles on agile system proposed by Rick Dove. This is a fundamental principle of agile organizational design. If contrary to this principle, organizational agility will not exist. In addition to it, the design should meet the following organizational design principles.

Figure 2. Resource Integrating Methods of Agile Research and Development.

Market-Oriented Principle. Agile organization is a new organizational model which responses to the rapidly changing, highly uncertain and unpredictable market demand. Therefore, when design the organization, it is necessary to be market-oriented, in order to ensure that the design includes cooperative organization such as the customers, suppliers, partners and even competitors, and is able to quickly respond to market changes.

Dynamic Optimization Principle. In order to adapt to changing market, instead of being static, agile organization continuously make adjustments and optimization inside to meet changes in market demand, and agile organization with the continual emergence of new technologies and applications, agile organizations will continuously be absorbed from the environment and their own new knowledge, new technology, and applied to the organization in order to remain competitive organizations.

Principle of Advantage Integration. Agile organization is formed through integrated internal and external resources. This is due to, the social division of labor and decision on the new economic conditions. There are some dependencies between every organization. Therefore, to maximize the efficiency of Agile organizations, a number of organization of different technical advantages must be integrated to form the core competitiveness of complement in order to ensure that agile organization rapidly do the fitful reaction to meet the market demand.

Principle of Resource Sharing. Resources include all information resources, human resources, equipment resources, knowledge resources, and organizational results, and other organization achievements in the agile organization. The resource sharing is entitled to every member in the organization within the cooperation field.

General Framework

Distribution of organizational boundaries and decision-making are two major factor considered by R&D organization to develop an organization. R&D organization depends on the interaction of the costs of external transaction the internal organization. The decision making in R&D organization will be based on the balance on the costs of internal information and agency costs. As shown in Figure 3.
Summary

With the development of the social division of labor, relatively static, centralized, compact traditional organization and management model has been unable to meet the growing demand of modern organizational management requirements while a relatively loose, dispersed, dynamic cross-organizational collaborative management model has been accepted. To increase the agility of modern organization, to better adapt to the change and meet the need of external environment and organizational tasks, the institute has been focusing on the research on how agile organization quickly organize, cooperate and integrate with the other organization and its internal and external resources.

As an organization, to adapt to changes of the organization from the external environment, we should consider how to optimize and change the structure of the organization from the perspective of the design process, to meet the requirements of agility. The R&D project is based on the needs of customers with a high degree of market-oriented features. Therefore, continuous organizational innovation can better ensure that the enterprise is able to accurately response to the demand of their market competitiveness.

References


