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**Factors Affecting Multifunctional Teams
In Innovation Processes**

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ABSTRACT

Structuring the innovation process and managing multifunctional teams is a basic prerequisite successful innovation. A well-structured process gives the possibility to implement effective multifunctional teamwork. Meanwhile, multifunctional teamwork helps to optimise and accomplish the innovation process.

Organizational support is necessary to achieve effective teamwork. Designing or changing the organizational structures for multifunctional collaboration is an important issue. Changing the system of performance measurement and setting up a multifunctional organizational culture gives employees strong signals that multifunctional integration is encouraged.

KEY WORDS: product development, innovation process, multifunctional team

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Chapter 1 Introduction

Multifunctional team became the standard solution for organizing product development projects. It's nowadays widely used in many successful global companies. First we will try to answer the questions, what is a multifunctional team and demonstrate, how is it implemented in companies. We then will discuss key factors influencing the efficiency of multifunctional teams.

1.1 Multifunctional Teams

A group of individuals brought together from more than one functional area of a business to work on a problem or process, which requires the knowledge, training and capabilities across the areas to successfully complete the work. This can be the definition of Multifunctional Team. But multifunctional teams do not spring full-grown simply by assembling a group of competent individuals and calling them a team [1]. This is a process for building cross-functional capability in a company. It requires upgrading leadership and team-memberships. It also demands organizational culture to become more interactive and less bureaucratic.

But what is different about multifunctional teams? Multifunctional teams typically comprise individuals with a functional home base (e.g. R&D, marketing, production, personnel, etc) but who work collaboratively on issues or processes requiring diverse resources. There are four key areas that distinguish multifunctional teams from more conventional teams [2]:

- Functional diversity
- Competing identities
- Integration in the organizational structure
- Performance expectation

According to the research work in 'the Institute for Employment Studies', teams are usually introduced by the following reasons [2]:

- 1) Innovation and new product/service development;
- 2) Problem-solving across traditional organizational/functional boundaries;
- 3) Integration of systems typically via process re-design/re-engineering;
- 4) Coordination into a 'one stop shop' or a single point of contact or delivery.

1.1 Applications in the Industry

Leading companies are increasingly utilizing multifunctional teams to enhance their ability to speed new, high-quality products and services to market.

"Pulling together a cross-functional team and leveraging our own expertise is one of our great strengths [3]." When Des Curran, **3M's** 1999 "Global Ambassador of Innovation," was told to reduce the unit cost of a line of 3M respirators, instead of tweaking the manufacturing process, he reinvented the product. And by using multifunctional teams is the way in which they were able to accomplish this.

DuPont has been involved in such kind of innovation teams for the last six years through the wide-scale implementation of PACE (Product And Cycle-time Excellence) [4]. Pace is a business-driven process for rapidly bringing robust new products to the marketplace originally developed by the consulting firm, PRTM. In PACE, the development processes are handled by a formally structured multifunctional product approval committee. The results from PACE have been significant, as it allowed many DuPont businesses to target their development resources more effectively. In addition, it allowed the company to respond more rapidly to marketplace needs. Those businesses using PACE have routinely seen an average of 30-50% improvement in cycle time.

At **Motorola** teams drawn from marketing, research, engineering and sales are often brought together and assigned a project. Members of these teams are first trained in creative tactics, such as associative thinking, and to work on a multifunctional team with training in the areas of conflict resolution. Motorola

claims that the multifunctional teams complete assignments in less time than traditional methods with many departments involved and that the training helped to streamline the team member's efforts into creative solutions.

Ford Motor Company has also taken the multifunctional team approach towards process improvement and creation with workshops known as Ford RAPID. The program of one or two day work shops place a mixture of department individuals on teams and meet to look at a process, identify the problems and recommend solutions. Ford believes that getting people from all parts of the process together allows them to see the forest rather than just their individual trees and is key for creativity and innovation to occur. [5]

According to the examples above, there is strong evidence that multifunctional teams save time and money in developing new products. The diversification and decentralization of businesses, the growth of international alliances and competition, rapid advances in technology, the increasing demands of more sophisticated customers, and the dramatic reduction of product life cycles have placed greater pressure on firms to effectively manage technological innovation and organizational change. Organizations must not only improve their ability to assess, coordinate, and integrate alternative technical developments within their business strategies, they must be able as well to effectively implement those strategies through the effective management of their technical professionals. Recent reports from both the National Science Foundation and the National Research Council said that the key to the management of technological innovation is the ability to leverage the contributions of technical professionals in cross-functional teams [1].

1.2 Factors Affecting Multifunctional Teams

Building an effective multifunctional team is a hard task, which is related to the whole product development process, the organizational structure and the human side as well. In the following chapters, three sets of factors are proposed, which are required if timely and efficient multifunctional teamwork is to occur.

(Fig. 1)

Chapter 2 introduces the set of factors, which has to do with the innovation process. Structuring the development process is the basic for involving teamwork. It provides the proper framework, in which activities of the team are involved. Chapter 3 introduces the second set of factors – organization support. Team is a small unit in the whole organization, and the organization is the infrastructure of teams. If the infrastructure doesn't offer necessary supports and environment for multifunctional teams, then it's unlikely that successful multifunctional integration will be achieved. Finally, in chapter 4, it's about the management of the team itself. It describes the actions details of those who are involved.

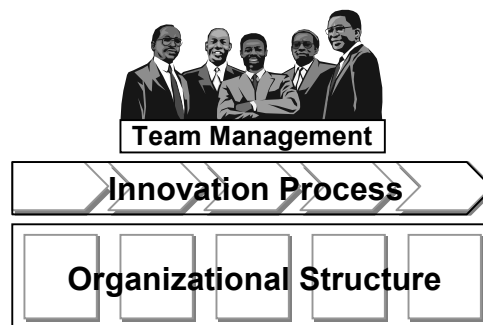


Fig. 1 Three sets of main factors influencing the team effectiveness

Chapter 2 Innovation Process

For multifunctional teams to become an organizational capability rather than a serendipitous event, processes need to be established. The structure of the innovation process largely determines whether multifunctional teamwork can occur. The process defines the activities of each development stage and the time point. Teamwork is involved in the activities to support the multifunctional integration and shorten the processing time.

2.1 Structuring the Innovation Process

Innovation process, including product development and commercialisation, is nowadays concurrent and team based. It cannot be structured simply as a sequential process where one functional area hands off outputs to the next. Neither can the process be structured as a set of parallel activities, where each functional area works independently of the others. From the start point, R&D, marketing, production, sales and even finance operate integrated. Otherwise, innovative products simply take too long to come to market. (Fig. 2)

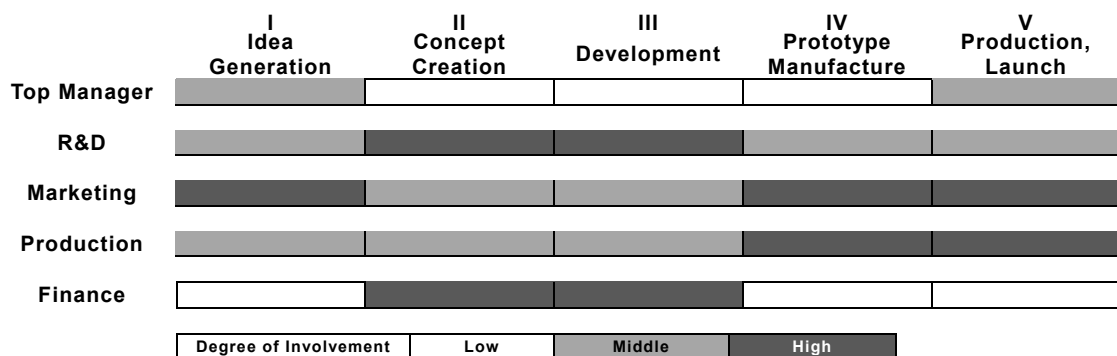


Fig. 2 Involvement of different functions in the innovation process

A well-structured process with an integrated set of activities is the basis for effective teamwork. Simply it answers the questions like,

- What is the team's mandate?
- Which functions are required?
- When should they be brought in?
- What are the guidelines from bringing new members up to speed and sending people back to their functional organizations?
- When they are no longer needed?
- ...

If the innovation process is to set the stage for effective multifunctional teamwork, the design of the process must include each of the functions having an important role in each of the stages of development. Therefore, key inputs are provided by each of the functional areas, and outputs are a result of a highly integrated problem-solving process. For example, in the general five phases development process, in the first 'Idea Development' phase, R&D, marketing and senior managers are involved in customer, technology and cost oriented idea generation. Production must be already actively involved in the second 'Concept Development' phase. Similarly, engineering must build very early prototypes to support marketing's desire to better understand customer needs. "In the past, R&D always drove the innovation process," says Jim Trainham, DuPont's technical director for its Dacron business, "we never had much (demand) from the rest of the business for new products. Now, every function has a specific responsibility, and product innovation moves right along because it is part of people's assignment to make it happen [12]". In the following chapter will discuss how to balance the participation of different functions in the teamwork. If these changes are accomplished, one effect is to pull forward in time the activity and involvement of the downstream functions.

After the process is structured, link the activities of the functional areas in time. In this way, the teamwork will be carried out systematically, and follows the goal of development. Multifunctional teams will operate most effectively when they are strongly challenged by, and connected to the strategy of the organization.

2.2 Involving Teams in the Activities

As the innovation process is the guideline of teamwork, on the contrary, an effective multifunctional team sits in the judgement and supporting position of the process. Therefore, one function is to check the performance of development or commercialisation. A project team can make go/no-go decisions at critical milestones from concept evaluation to product release. The other function is to add activities in the process to support the multifunctional interaction. ‘Stage-gate System’ may be one vehicle for linking the activities of the functional areas in time and adding activities that support multifunctional interaction [8].

As mentioned in the preceding section, the innovation process is structured into a set of stages and activities with the time points. When the activities to be performed at each stage are designed to be an integrated set of activities requiring multifunctional involvement, a foundation for multifunctional teamwork is laid. In the Stage-gate System, gates or decision points are set according to the process. It is the control of the entrance to each successive stage and passing the gate criteria requires highly integrated decision-making. Multifunctional team acts as the judge at the gate.

It not only decides the proceeding of the process, but also supports the process with the special multi-functions. For instance, engineers may be required to participate with marketing in interacting with customers. Production may be required to do process development during the concept development stage in collaboration with design engineers. These activities help the process to pass the decision points and reduce mistakes.

Structuring the innovation process is the basic prerequisite for teamwork. Without the process, there’s no cooperated teamwork. And without well-designed process, there’s no effective teamwork. This fundamental factor is not a sufficient condition for effectiveness. In the following chapters, other conditions that are necessary for achieving effective integration across the functions will be discussed.

Chapter 3 Organizational Support

Organization is the infrastructure of teams. A recent major study of work teams found that nearly 80% of the respondents named organizational barriers as the major roadblock to effective teamwork. Equally an organizational culture should be built in which multifunctional teamwork can thrive. Teamwork is further affected by human resource systems that are designed to measure the performance. Moreover, multifunctional teams can represent the ‘coalface’ of organizational learning. This is the enormous potential contribution of multifunctional team to their organization.

3.1 Designing Organization for Multifunctional Collaboration

Traditional organizational structures and management processes often work against efficient and effective multifunctional integration. The fact that multifunctional project teams must work horizontally and most organizations are designed vertically, which create conditions ripe for competition, conflict and role ambiguity. And this kind of hierarchy also blocks the transfer of information. Multifunctional teams need a hierarchy, which is interactive and transparent, and information should flow up and down freely. (Fig. 2) This strategic hierarchy includes the strategic level, which determines market positioning, the team leadership level, and the ‘doing’ level of team members. With the no barrier information flow instead of ‘throw over the wall’ information transfer, teamwork will be more effective.

There’re different kinds of organizational structures, such as functional organization, divisional organization, matrix organization. How to modify the organizational structure to fit to the multifunctional teamwork? In a multifunctional team, R&D, production, marketing and other functional groups are brought together to focus on innovation decisions and participate in its workflows. In general, this situation is that the participation of each functional group is not very well balanced.

- Production groups' participation and contribution are significantly lower than others.
- The R&D groups' participation and contribution are higher than any other's and emerge as the clear owner of product development activities.
- Marketing groups perform relatively more tasks and participates relatively less in decision-making.



Fig. 2 Information flows freely up and down the hierarchy

A functional group's participation appears closely related to its contribution – when participation is low, contribution is low, and when participation is high, contribution is high. Describing the link between participation and task performance, a manager notes [9]:

“When we want our (marketing) people and project engineering people to become involved and start moving forward (i.e., perform NP-related tasks), the most effective thing we can do is have a group meeting and allow everyone to participate and analyse the opportunity as a team. So, they all feel a sense of ownership and contribution.”

The R&D function can no longer simply be content to invent, but instead must create sustainable value up and down the entire value chain. To meet this challenge it must participate significantly in establishing corporate strategy. Business and technology planning must run in parallel, both responsible to customer needs. To understand those needs researchers are mingling in the

marketplace, as never before, as the days of the white-coated lab technician operating apart from the outside world are gone forever. “R&D needs to be much closer to the marketplace, where changes that occur in society and the economy are the basic stimulants for innovation. [12]”

“However, it’s not easy to get the balance of functions in multifunctional teams. Several contextual features explain why higher levels of participation and integration of activities do not result in high levels of cooperation.”

First, clear differences in the functional groups' stature, and inequities in decision-making power, contribute to the problem. Where inter-functional cooperation is noticeably low, R&D is viewed as being the most responsible for innovation and production the least. The growing interest in total quality and customer satisfaction, coupled with the view that marketing represents the customer's voice, has increased the marketing group's participation and contribution in some firms. But these developments have done little to change the stature of production groups. A manager overseeing manufacturing, explaining that important decisions are made mostly by design engineering (R&D) and marketing, leaving the production function outside the loop, states [9]:

“... if you look at the design development checklist, the sign off ... the approvals to continue with phases (of product development) are basically (the responsibility of the) product team (the marketing function), and engineering. Not manufacturing. So manufacturing, while they can go to the meetings and contribute, the real sign-off and approval of taking the project forward does not include them. And that's a standard, that we are a side player.”

Second, because of R&D's de facto ownership of innovation activities, it appears less enthusiastic about cooperating with others, and less concerned about censure or retribution from senior management. Others are more often asked to cooperate with R&D than vice-versa. Additionally, there is a prevalent view within R&D groups that innovation processes are esoteric, futuristic pursuits that

do not concern the production groups.

Third, R&D's concern for serving future customer needs appears to clash with production's concern for serving current customers, and the two groups frequently compete for resources. There are some instances of higher participation of production groups in NP decision-making. But instead of signally improvements in their stature, however, these instances are more indicative of R&D's attempts to ensure that: (1) its designs are practical, significant and reproducible in the factory, and more importantly, (2) R&D is not forced to shoulder the entire blame for delays in new product rollouts or production glitches.

How to solve the problem? Marketing and production's participation and contribution increases most often after top managements do the following:

- Pressure R&D groups into sharing some of their control over innovation activities.
- Empower explicitly R&D, production and marketing groups to make decisions as equals.
- Make sure that all participants are equal voting citizens, and share equal stake in outcomes.
- Build high levels of transparency and keep mindfulness in actions.

3.2 Measurements of Performance

Individual contributions to teams should be evaluated, with supportive incentives. Include measurements by customers, who in the case of R&D may be production or marketing organizations. Those who contribute by teaching and facilitating knowledge creation should also be rewarded. Incentives should balance team success and individual.

3.2.1 Performance Appraisal

Performance appraisal is an important means for obtaining credit for work in a multifunctional team. Unfortunately, in many instances assessment of a

team members' performance on a multifunctional project is missing from the formal performance evaluation process, and team members' contributions to the project team go unrecognised and unrewarded. Then employees receive the message that teamwork is not valued by the organization. The bad influence is obvious, that not only teams will not work effectively, but also employees are not willing to join a project team.

Often, this is an error in the performance appraisal system. There are different kinds of project teams. Some of them need team members work part time in the team and still keep their position in original divisions. Some of them need members contribute their full time in the project and get out of the original division completely. If the performance appraisal system misses the part of teamwork, then team members' work cannot be known by the department managers. In this case, changes are needed in the organization's performance appraisal process.

First, the performance appraisal process must include an evaluation of the employees' contributions to the team outcome. The evaluation can be done through the feedback of the team leader and members. Simply add these to the formal evaluation process.

Second, this feedback can be weighted in proportion to the percentage of time the employee was dedicated to the team when deriving the final performance rating.

Third, give more attention to career paths that reward people for acquiring multiple skills and broadening their knowledge base. Make explicit criteria in the performance appraisal system or promotion system about career paths, which emphasizing on developing a broader base of skills.

3.2.2 Promotion and Payment

Related to performance appraisal process, if highly integrated multifunctional teamwork and cooperation are truly goals of the organization, promotion and payment policies must be taken into consideration.

Promotion is a powerful way to reward teamwork and multifunctional collaboration. It sends clear messages to other employee in the organization that what is valued and rewarded. When promotion are announced throughout the organization and it is made explicit that the promotion was contingent on persons' skills as a team player as well as technical skills, the link between teamwork and rewards becomes firmly established.

Payment policy is the same theory as promotion. Redesign the compensation system and send powerful signals to employees that multifunctional collaboration is the organizational goal. There're some suggestions in compensation design in order to achieve multifunctional integration.

- Include cooperation between the functional areas as an explicit factor in the performance appraisals for general managers and project and team leaders.
- Make rewards contingent on performance measures than reflect the combined efforts of all the functional areas. For example, rather than using function-specific performance criteria use profitability measures for a given product.
- Offer extra reward after the project done according to the result, which sending the message that multifunctional teams are being specially considered.

3.3 Organizational Culture

Multifunctional teams require cultural operating principles that are understood and practiced by everyone. There should be a process for developing and communicating these principles. The following excerpt from Bob Hershock at 3M describes the challenges that management faces in attempting to establish a culture that supports the use of multifunctional teams [13].

“When we first contemplated (multifunctional team), we were fully aware that our organizational policies and our management styles weren't set up to handle the special

needs of teams.... Now, instead of the team serving the needs of management, the organization would serve its new internal customer – the team. Division managers and directors had to change their roles.... Now they had to become enablers, going out of their way to help them (teams) accomplish their goals.”

It's not an easy task to effect cultural change in a company. The changes of measurements of performance, which are explained in the preceding section, help the change in culture. But this is only the easy 'hard' part. The 'soft' cultural principles need to be supported by top management. They are in fact harder to develop than the 'hard' factors of roles and measurements. Organizational values need to be clearly communicated throughout the organization. Top management must be a model multifunctional team, if the values and attitudes needed for effective multifunctional integration are to be established in the organization. Employees engage in behaviour that they believe will be rewarded and pattern their behaviour after senior people in the organization whom they respect and admire. From top to end, in this way, the change of organizational culture will take place.

3.4 Learning Potential

Multifunctional team experience is a powerful opportunity for self-development. The reality is that the majority of knowledge sharing and innovation within organizations occurs through people interacting with people – especially within networks, groups or teams that cross conventional organizational boundaries. Using teams to achieve effective knowledge transfer throughout the company and continuously to affect teamwork's effectiveness, this is an optimised way of working.

Moreover, experts need a home where they share specialized knowledge with others in their own field. Technical disciplines still have some qualities of craft guild. The difference between traditional guilds and the present day is that with the breakneck pace of innovation, the young often know more than the

master craftsmen. This is especially the case with information technology. By multifunctional teams, everyone in the team should either add value or demonstrate innovative potential. This can also form a learning culture in the organization. For example, people not only reflect on the relation of practice to results but also question their theories when the results don't meet expectation. Failures are shared and used as opportunities for learning better ways of doing things.

Have a look at what can be learnt through multifunctional team will make the 'learning potential' more convincing. There're at least three definable categories or types of learning distinguishable from one another in terms of the knowledge and skills [2].

Learning about self

- Enhance personal effectiveness via generic interpersonal, interactive and communication competencies.
- Team membership enables people to rethink themselves and their own motivations, learning styles, etc.

Learning about the organization

- Get a better understanding of the interdependencies of different parts of the organization and related processes.
- Appreciate the complexity of managing change and understand the problem solving and decision-making.
- Identify improvement opportunities and build shared vision, etc.

Learning about other specialism

- Acquire particular functional or job competencies, tools and techniques, which are typically used by other specialisms.
- Become familiar with the requirements of others' working methods, professional standards, regulatory requirements, etc.

There're roles for HR, team leaders, sponsors to maximise the learning potential of multifunctional teamwork for individuals and their organizations.

- 1) The resourcing or allocation of talent and skills to teams and their re-entry to the 'mainstream' organization.

- 2) Coaching and learning support to team members.
- 3) Facilitating relevant team development and training in team dynamics, group problem-solving techniques, etc.
- 4) Realigning HR systems, reward, performance appraisal, and career management.
- 5) Developing the team as a 'learning community', capturing and transferring knowledge gained to the rest of the organization.

The organizational structure is the infrastructure of multifunctional team. Only with the support of organization can teams work. Only with a designed-for-team structure can teams work effectively. Till now, with the innovation process and organizational structure, teams have the basis and environment for effective work. The only issue left is how to manage the team itself.

Chapter 4 Managing the Team

The preceding chapters describe the required infrastructure for multifunction integration. However, how to manage the team is a decisional point to achieve effective multifunctional teamwork. The content covers the role of leaders and members, team size, training and empowerment. In the end, as a conclusion of team management, there's a list of characteristics of effective teams and a questionnaire for checking the effectiveness.

4.1 The Role of Leaders

Teamwork cannot be effective without proper leadership. How company leaders behave to support the multifunctional integration, how to choose team leaders with the knowledge, skills and abilities, how team leaders optimise the team process are the questions being discussed in the following.

4.1.1 Company Leaders

The leader of the company offer strategic leadership, which designs and communicates a three to five years vision for the organization and the assumptions underlying it. At this level, business opportunities are identified in terms of value propositions. Thinking about the following questions and then define the required teams:

- Who are our customers?
- What value do we offer them?
- How will we create this value?
- How should we be recognized by the market?
- Has our business communicated its needs and expectations to associates?
- What kinds of teams are required?
- What skills do we need?

- What are the investment priorities?

With the answers of these questions and the respondent actions, a team-oriented atmosphere will be created, which supports the multifunctional work.

With the basis, thinking about innovation, it's very important to have leadership sponsors. "We have studied hundreds of innovations within large organizations. In every case, at least one sponsor with a close relationship to the intrapreneurial (intra-corporate entrepreneur) team guided them around obstacles and intervened with the hierarchy to keep the project alive. There is no innovation in large organizations without sponsors. [6]" But simply creating a collection of individuals with the title 'sponsor' and giving them a job description isn't enough. Like the innovation process, this sponsorship is also a 'process' for building an effective and comprehensive teamwork. What the leaders need is to go beyond just thinking about the 'who' of sponsorship, but also the 'what', the 'how' and the 'when' of the process of ensure the innovators get what they need to become successful. Gifford Pinchot (author of Intrapreneuring) outlined the key roles leadership sponsors need to play to make innovation a reality [6]:

- Set the context – communicate a clear vision for the organization,
- Choose projects to sponsor,
- Find and select innovators – bet on people, not just plans,
- Form cross-functional project teams – strive for functionally complete teams,
- Support the team – provide resources and a 'one stop shop' for decisions,
- Guide the team – set milestones, ask the right questions and know when to redirect the team's efforts,
- Reward the team – keep them on track.

These roles of company leaders may have some overlaps with the tasks of team leaders. It's more strategy-oriented and tasks of team leaders are more detailed. Effective sponsors play out these roles in an active mode, organizing

them in an integrated flow. Rather than passively looking to others, they shape the world to enable innovation to happen.

As an example of how a powerful sponsor can lead a successful innovation, the DuPont Stainmaster Carpet story is a dramatic illustration of the impact from an effective sponsor [4]. When Stainmaster was introduced in 1986, it revolutionized the US residential carpeting industry by bringing long-lasting stain protection through new polymer card fibre coating technology. Even today, Stainmaster holds the largest share of the branded US residential carpet market. This innovation came about through the active sponsorship by Tom McAndrews, who was director of the Flooring Systems division. He saw the marketplace value of the technology that Fibres R&D had uncovered and then committed time and energy to organize the process to make it a commercial success. McAndrews was quick to grasp the complexity and scale of effort, and systematically put into place the elements needed to deal with them. He formed an innovation team and staffed it with his best people. McAndrews consistently demonstrated total confidence in the team, running interference for them with corporate management and major customers. He gave the team guidance and help as they organized the multiplicity of supporting teams. He provided the resources the team needed and help them to respond rapidly to problems. Throughout, McAndrews maintained an unwavering constancy of purpose despite intense pressure from all sides—building an intense winning spirit and commitment to his “noble quest.” McAndrews’ impact was pivotal, and demonstrated what a sponsor can accomplish. Intuitively, he covered all the roles Pinchot identified.

4.1.2 Team Leaders

Under the strategic leadership, team leaders offer operational or functional leadership to the teamwork. They take over the job to find the skills needed, organize teams and facilitate their activities. Team leaders must push the process forward, communicate and over-communicate, follow up and make sure that everyone is heard and conflict is brought out and resolved. They also select and

develop people according to the kinds of skills needed for the project, making sure that the professionals keep up with their technical fields and with advances made in other companies.

As a connection of project team and company, team leaders need to pay attention to some aspects [7]:

- 1) Describe the job, including expectations of team involvement, training, cross-functional cooperation and understanding of objectives.
- 2) Ensure that teams are focusing on the critical issues and challenges.
- 3) Train team members to rely on data and make decisions without emotion.
- 4) Eliminate non value-added activities and optimise the process.
- 5) Acknowledge and embrace the risk inherent in any cultural change.
- 6) Always tell the truth to team members.
- 7) Anticipate that there will be pain and conflict and be prepared to help people through that.
- 8) Get rid of fear and become champions of change.
- 9) Be patient to team members to experience success through change.
- 10) Give sponsors and company leaders special attention, since they're critical to the realization of any changes.
- 11) Create trust and respect atmosphere and trust in the untapped talent of team members.

From the description above, team leaders not only need to have management skills, but also must be able to follow the often highly technical nature of a team's work. There're three kinds of competencies needed by multifunctional team leaders [8].

Interpersonal Skills Leaders must have the ability to understand and facilitate the human dynamics of the team. It entails skills such as establishing norms for openness, candor and respect among the team members, facilitating constructive conflict resolution, managing group discussions to ensure equal participation, and helping the group reach decisions through consensus building.

Technical Skills Team leaders must have sufficient expertise across

disciplines to see the big picture, anticipate problems and guide the structuring of the team's activities. The breadth of the team leader's technical expertise and experience with the product development process is critical.

Social Skills Team leaders often work with authority over the resources needed to accomplish their task. This frequently involves influencing people outside the team's boundaries. Moreover, the uncertain nature of the outcomes of the product development task itself often necessitates that the team leader gain organizational support for the project. Because of these, their social skills, such as, ability to influence others through persuasive communications, listening, negotiating, constructive conflict resolution, and maintaining open relationships with key players external to the team, become a critical resource to the team.

4.2 The Role of Team Members

The impact of team members is as critical to effective teamwork as that of leaders. First of all, how to find out motivated people for the team. Effective team members have some common features [9]:

- Interest in adopting new ways of thinking and behaving concurrently with the demands of the new, emerging technologies and customer needs.
- Implicitly acknowledge that all product development participants are reciprocally interdependent.
- Participate in moving the product development activities forward.
- Willing to participate in dialogues that reduce hidden agendas that impede product development activities.
- Feel a sense of belongingness and cohesion that they attribute to their involvement in product development activities.
- Feel a sense of ownership and personal stake in product development activities and its outcomes.
- Attribute a higher level of trust to others, admit mistakes when they occur, and openly share and solicit information.

With the effective follower ship, how to find out members equipped with required skill is the second important task. Team members must be both technically proficient and good team players. Thus, there're two kinds of skills needed by multifunctional team members [8].

Technical Skills Members should be expert in their relevant disciplines. There's no substitute for good technical experts and the innovation can only be achieved by the work of these experts. When there is insufficient expertise in the team, decision-making and problem solving will be suboptimal. Besides the knowledge in their specialized fields, understanding of the vision, what the organization is trying to accomplish over the next three to five years is also necessary. This understanding directs their priorities and focuses thinking.

Interpersonal Skills Technical professionals cannot do their research work individually; they must work together to build cross-functional relationship. They need to be skilled in communications, conflict resolution and group problem-solving and decision-making techniques. Team skills, like brainstorming, listening, asking, clarifying questions, seeking consensus are basic skills need to be trained. Moreover, if the team's members think of their roles only in terms of their discrete contributions, the value of teamwork and potential for integrated problem solving is lost. So team members need to stretch themselves to learn how and why other disciplines think the way they do and respect for the contribution of each function. It would help if members invest time in getting to know each other's background and interests.

4.3 Team Size

Good team environment and working atmosphere are dynamics, which are difficult to establish in any team. It becomes increasingly more difficult to achieve as team size increases. As team size increases, decreases are witnessed in team productivity and in team member accountability, participation and trust. But product development requires inputs from many groups, hence the tendency for team size to be large. It would be a problem to keep a relative small team, 8

to 12 members, when the task requires the work of several functions and sub-functions.

The approach can be applied to multifunctional teams to keep team size small is to use a core team. The core team approach requires that representatives be selected from each of the functions critical to the product development effort. **3M's Project System** is a good example for core team. In 3M's famous project system, an idea is brought forward by a team of three: one from marketing, one from research, and one from manufacturing. The commitment of the three members with functional skills means the venture has already passed through three different screens, and thus the project is given the benefit of the doubt and is supported. The formation of the team points to the presence of an entrepreneurial leader who can attract talent and skills. This core team can then stay with the project until it becomes a full division. "Individually, core team members represent their functions and provide leadership for their function's inputs to the project. Collectively, they constitute a management team that works under the direction of the ... project manager and takes responsibility for managing the overall development effort. [10]"

4.4 Team Training

The aim of team training is to obtain effective multifunctional interaction within the team. So, it's not enough for the team members to be trained in communication, conflict resolution, problem-solving, and decision-making method. Nor is it sufficient for the team leaders to be skilled in management techniques. Neither is it sufficient to equip them with technical skills. First of all, the team's ability to work together effectively and efficiently depends on the attitudes of team members. With in this mind, there're three layers about team training:

- Attitude training
- Teamwork skill training
- Technical skill training

Traditional organizational structure, professional hierarchies, and our culture's emphasis on individual achievement all work against effective multifunctional teamwork. Experts do like to come together, share resource, share responsibility and share output as well. People are lack of trust and respect. Therefore, it is necessary for organizations to invest in training team members and leaders to have the attitude of working together.

Teamwork skill training includes communication, conflict resolution, group problem solving, decision-making, brainstorming, seeking consensus, etc. It meets the requirement for team member's interpersonal skills, which is described in the preceding section.

Technical skill training mainly includes understanding and appreciation of the contributions made by the other functional areas. The interdisciplinary training not only aids in breaking down barriers to multifunctional communication, but also enables team members to know enough about the other areas to ask the right questions and evaluate answers received.

There're several different ways of training that meet different layers of training aids.

- 1) Team building is a specific form of team training and can facilitate the team's development. Team building usually consists of the entire team going through a structured set of activities together, which help members better understand how their personal preferences and biases get in the way of the team's process. Team building fits more to 'attitude training'.
- 2) Workshop of team skills is an intensive and quick training way. But it takes time for team members to master these skills by using them in teamwork.
- 3) Job rotation is a good way for technical skill training. It's also another way to build trust and respect among team members, which helps the attitude training.

4.5 Team Empowerment

Empowerment provides the mechanism by which communication and problem solving occur across the functions. First of all, certain conditions for teams to be empowered must exist.

- 1) The team must be given the authority to make decisions that affect their work.
- 2) The team must be given the resources needed to carry out their work and implement their decisions.
- 3) The team must be held collectively accountable for the outcomes of their work.
- 4) The team must be rewarded based on the outcomes of their work.
- 5) The team must be supported by an organizational culture where managers are willing to work collaboratively.

Setting goals, assigning roles, planning, making decisions, holding meetings, communicating, exercising control, and monitoring and providing performance feedback are all activities in which multifunctional teams engage. The empowerment of team members, team leader and sponsor (if the team has) is showed in Table 1 [8].

Activities	Team members and leader	Sponsor
Goal setting	Members with leader set team goal.	Ensures the goal fit with organizational strategy.
Assigning roles	Shared responsibility. Leader provides directions and facilitates teamwork.	Resource and consultant to the team.
Planning	Members plan with leader.	Coordinates plans with other organizational unit.
Decision making	Shared responsibility. Leader provides directions and facilitates teamwork.	Consultant.
Meeting	Members and leader jointly set agenda and meet. Team leader leads.	Resource.
Communication	All team members and leader in the communications loop.	Is kept informed and communicates with groups outside the team.

Control	Team and leader exercise control.	Is kept informed.
Performance feedback	Members and leader assess team's performance.	Provides input from other stakeholders.

Table 1 Empowerment of team members, team leader and sponsor

4.6 Characteristics of Effective Teams

As a conclusion of this chapter, the following is a list of characteristics of effective teams [11]:

- Inspired leadership
- Specific, quantifiable goals
- Commitment and loyalty
- Effective communications
- Achieve small victories along the way
- Think competitively
- Open minded and progressive thinking
- Recognize superior performance

Affirmative answers to the questions in the following list means that a team is enjoying good progress and is functioning in an effective manner.

Understanding of the project

- Can members describe the business of their work unit?
- Do they know the general work flow?
- Are they aware of interaction with other areas and departments?
- Do they understand the impact on productivity and costs?

Organization

- Does the team plan effectively?
- Is the team run according to the code of conduct?
- Is work responsibility spread equally?
- Does the team gather the resources they need?
- Is the team making full use of group resources, skills, and knowledge?

- Is past progress summarized and new action reported?
- Are procedures flexible and appropriate to the group?

Communication and Cooperation

- Do members feel comfortable speaking to the group?
- Do members express their ideas clearly and concisely?
- Does the group maintain contact with management and other teams?
- Do team members help each other?
- Do group members actively support each other?
- Are members open-minded and willing to listen to other ideas?
- Is the group open to the leader's suggestions?
- Does the leader influence the group and the team respect the leader?
- Do the members focus on issues rather than personalities?
- Can the group reach a compromise?

Loyalty, identity, and morale

- Are member enthusiastic about attendance and the project?
- Does the group feel confident and competent in their task?
- Do members volunteer for group work?
- Do team members take responsibility for organizing?
- Do members seem to enjoy the problem-solving process?
- Can the team accept failure without feeling defeated?

Chapter 5 Conclusion

In the preceding three chapters, main factors that affect multifunctional team's effectiveness are discussed.

Structuring the innovation process is the basic prerequisite for teamwork, which offers the guideline. A well-structured process gives the possibility to have effective teamwork. Meanwhile, multifunctional teamwork also helps to optimise and accomplish the process.

Organizational support is the necessary infrastructure to achieve effective teamwork. Designing or changing the organizational structure for multifunctional collaboration is the most important issue of this part. Changing the system of performance measurement and set up the multifunctional organizational culture give employees strong signal that multifunctional integration is encouraged. Learning from teamwork is the potential function of multifunctional team, which benefits the development of organization.

Managing the team is the detailed and concrete factors. Choose the right leader and team members, who play proper roles in a team. This makes the team really work. Small size, training and empowerment are the assisting issues that make teamwork more effectively.

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