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Abstract

A disaster case of project implementation has always brought about opportunities for implementation and ramification of continues improvement process. This paper addresses concurrent engineering (CE) and cross functional teams. However, we may recognize that the cross functional training team structure and characteristics contains both elements of differentiation and integration. Cross functional teams take on more process ownership in commercial activities to improve product or new product intervention. Intensive research and studies supports the idea of cross functional teams as the way to identify and eliminate redundant efforts and delays in all aspect of the project from design to end line product release to market. Also, I would introduce examples and a designed training program to support cross functional teams and propose proper training program needed to issue process success.

Introduction

According to conference Board's definition, education concerns information, concepts, and intellectual ability, while training concerns skills acquisition through repetition in performance (LUSTERMAN, 1997).

In 1986, RCA experienced a great deal of pressure from the competitors in the electronic industry. French government's electronic firms started to challenge RCA new products and components. At the same time, RCA lost market shares to Japanese electronic companies and withstand acquisition made by General Motor.
Looking closely at RCA's organization structure at the same period indicates that the design team was a sub-function of product planning group and it did served as a independent team through out the company's infrastructure. In order to win the market and introduce better quality product, management introduced a new structure to the organization. This structure supported the idea of installation of a cross functional product team consist of , the industrial design group, the national advertising group, and the innovation group.

The cross functional product team was lead by design staff, but team felt that the need of other skilled professionals such as marketers, engineers, CAD experts, advertisers, was needs as well. This collective idea was accepted through the management and entertained in the team.
The new strategy not only made the design team the focal point of the product intervention and development, but also introduced transfer skills, team work, and team problem solving skills as part of the RCA's culture. RCA's new team was made of a web of all skills needed to define the new product definition, manufacturing, and distributors to the customer. Today's RCA product not only serviced the master troublesome situation, also they are noted as complimentary products as well. This example describes the power of the cross functional team and how the installation of the cross functional teams improved a new product life cycle and quality.
Concurrent engineering is a process which pipes all the area activities to a preferred cross functional team. This process aims to obtain shorter and safer product cycle time, cost reduction opportunities, and increases product quality.

Chrysler Corp. Was one of the users of concurrent engineering process. The company build a new factory and moved in their Co-Located teams of skilled designers, planners, engineers, and product personnel to produce new series of cars. Team completed the project in the world class cycle time and targeted to minimize redundancy. Part of the cross functional team's characteristic is that the team as one body comprehends the task in hand and expectations. Also, it practices required skills needed to achieve success and adjust to perform the given assignment. In a some , concurrent engineering may be characterized as the project implementation and ownership via cross functional teams.

Cross Functional Training

Although in the human history, the introduction of new technology is not a new idea, but each case of introduction of new technology to manufacturing floor is a new challenge for the cross functional teams due to historical economic organizations and effects on people's lives. To insure design implementation and out put of a new technology, brainstorming and consultative process can be used to introduce and open the floor of challenge for creativity and continues improvement process (CIP) as project progresses. Some of the important aspects of consultative process depending on new technology introduction includes:

1) Create ongoing training facilities such as company's technical library, web sites, and training rooms.
2) Create ongoing opportunities for the employees to in role in local colleges, technical schools, and universities.
3) Obtain ongoing training resources using technical experts of the companies as mentors and serving as trainers.
4) Create modern workshops and employee technical chat rooms.
5) Create ongoing programs to link company's technical resources to out side consulting firms and inventors.
6) Support employee's working group organizations across (Virtual Factory) VF.

To comprehend and insure the new product intervention success in the world of technology, all parties of R&D and professionals such as inventors, researchers, managers, and engineers may need to perform organizational flexibility as their challenging roles. The key element to achieve such a goal is the implementation of job rotation and strategic cross training plans for the R&D driven groups, engineers, and managers.
In addition, support direct transfer of development teams from R&D to production and link that to suppliers. The demand of market from new technology intervention and acquisition is to meet customer requirements and demands, so then one can create a functional environment were R&D teams comprise product experts in such a divers atmosphere.

To achieve such a request we can introduce the moving agent, all skilled team members, through other divisions of the product process flow to share expertise in a transitory mode. This will assume flexibility and will demand the project team to break through their rigid infrastructure and pipe their expertise to other cross functional areas through the product life cycle.

The strategy amounts to achieve success and increase productivity and out put of the cross functional team is a structured training plan that insures OJT and rotation of all team members involved in the product process flow. The main tactic shall include transfer

holistic understanding of the seeds of technology acquisition and manufacturing process requirements through all cross functional team members involved.

To achieve the competitive edge, firms need to clearly set goals to analyze and understand customer requirements and provide such a dedicated and devoted system to deliver product to market on target, the first time and every time. In such a outraged environment, it is the upper management responsibility to insure flexibility through out the firm's infrastructure and organization and define all groups job description, roles and responsibilities and provide support to insure company success. Management will need to oversee progress and evaluate the rate of progress of organization and frequently be willing to introduce changes through out the organization to resolve road blocks.

Diffusion of New Technology Development / New Skills / and training

In the world of new technology introduction, there exist a realistic difficult role of the management group whom is tasked to insure implementation of new technology development and the role is to identify the skill set requirement of the supporting force. Considering elimination of concurrent engineering concept, mistakes in skill matching with required task can be identified as great cost to the firm and effect the out put of the floor and customer relations.

In terms of projects involving new technology introduction and automation, there may be an opportunity for the " RE-Skilling " and usage of less skilled workers (Chip Labor) with a opportunity of training process as a support to high skilled labor and work force (Expensive labor). This idea varies as one explores the nature and type of new technology in different industry sectors. In a case of introducing automated computers programs and subroutines that are user friendly with respect to society general knowledge level. The programmed controlled systems and tools originated to eliminate machinist skills and augmenting technical capacities, but in reality, the adaptation of such intervention did not lead to diminishing of machinist's skill set.

" The numerically - controlled machine tools were originally developed with the dual purpose of diminishing reliance on skilled machinists and augmenting technical capabilities, but in reality, there decade since the development of the NC machine - tool , it adoption has not led to any general trend to the elimination of the skilled machinist " .

In general, the idea " RE-Skilling " makes a better since in the frame work of new technology introduction when the management explores the changes, understand the new technology and asses the hypothesis of updating and rectified skills. In this case the labor

work force skill set will be required and concurrent engineering applies. These teams can use computerized systems to help engineering and prototype manufacturing operations.

To assume higher responsibilities on quality output, increase and add new criteria to new training requirement and specialize in an area with a narrow and more detailed job description is required and needed. Indeed, one needs to realize that with in more assumed responsibility, there will be more stress and more advanced training courses and classes that would require more involved science / math, chemistry, physics, basic engineering knowledge, designs and planning, process skills, and environmental safety and health training.

The new tasks effects departmental and organizational plans and drives the workforce to increase general education of the groups.
These changes in technology are signs to the organizational managers to introduce changes to the firm's infrastructure prier to NTI period. Introduce more focused training groups such as electrical , mechanical, layout, planning, implementation installation, process, qual, contract, and support working groups to increase team work and exercise CE process.

Transfer Technology Learning's:

There are 3 important notes listed in this section to help technology in the frame work of technology diffusion:

1) Promote and set goal to transfer technology to new facilities through documentation and training programs at current sites.

2) Value and set goal to improve relations between new site organizations and current site organizations for transfer new process finding and amplify process changes (CE!).

3) Create expert boards to oversee and control changes effecting facilities and process qualifications. Insure regular interface (were is possible and value added). Insure flexible training structure and research and evaluate training programs to achieve an standard training requirement's for all the team members, not to emphasize more that it is required that TIMING IS EVERYTHING.

The firm hallmark of success in new technology introduction depends on the accurately planning and timely calculated out put to the market, which this out put may depend on the firm's infrastructure as the conduit to implement a system to transfer knowledge and oversee quality via concurrent engineering, cross functional training and share expertise in different areas of product process flow.

General Training objectives and skill set checklist

A good training program may be defined as a system offering expertise required to start and end a job in a timely manner. Also, the system of training should carry inbreeded characteristics such as listed as following :

1) Class supporting documents: To supply documentation availability, trainer may use the firm's library facilities, employee resource center, or other areas that have around the clock access coverage and services to provide documentation to the trainees. Provided documents should include:

A) Supplier provided tool documentation and references.
B) Supplier's tool manuals and schematics.
C) Class lecture copies
D) Basic process manuals.
E) Over view of science containing building blocks of the training such as physics, math, and chemistry.
F) Manual containing course summary.

2) Trainer should maintain a record of all students for new updates, developments, to reach trainees.
3) Training class availability: Early training class availability is the key.
4) Training system and trainer should facilitate and insure trainees enrollment to user groups as needed.
5) Maintain a consistence computer based training courses covering the training material. In the case of timing conflict CBT will help to meet training requirement's.
6) System may insure to pass proper and well though out ideas via change control board , to perform consistency and integrity of training process.
7) System should provide a plan for multi lingual renditions during documentation of course.
8) Training classes agenda should address and state the training concentration result of the training class.
9) Classroom and the training facility needs to meet the facility and capacity standards: To enhance the training environment, class room must provide safety and comfort. In addition, based on level of training class, there should be an standard number of students and trainers available.

10) Tool availability : Training system should have adecquide training tools and materials . Variety is a important point here. Based on student selective habits, system training may provide varieties to insure learning process.

Training sources

1) Vender and equipment manufacturer.
2) Vender and process manufacturer
3) Consultant and field experts
4) Educational systems such as state and privet universities and colleges.
5) Government
6) Firm's training groups and experts. Company offered classes
7) workshop's
8) Convention
9) Papers, research, and presentations

Table One

Strategic training goals for factory of the future

The leading philosophy to approach success in the future of manufacturing floor is not technology alone. We must include workforce intellectual ability, massive and rapid product innovation and development, flexible frame work and infrastructure, global strategies and tactical planning including customer based requirement's and needs to insure high performance.

In the world class factory of future, flexibility must revolve around customer, market needs, adopt changes, provide vast communication network and decentralized management, and be able to entertain work force intellect to cross functional teams.

The factory of future organization structure would insure flexible training provide incentives to employee's for their knowledge base requirement's and meeting required training process. To insure flexible training would be exercised and preferred.
The goal of world class factory of the future training program not only targets traditional training process, but also it should include environmental safety, health, strategic and tactical planning, organizational disciplines, labor relations, vender relations , manage out puts, manage long and short term goals, learn one team concept, and market analysis.

As table two describes there are four areas of training which starts with basic science that all members of the cross functional team needs to master. This step of training program is the building block of the next step to come . The second step course design as a general term. Team base knowledge will be used in this step to complete all the designs and calculations needed to insure reduce cost, duration, and insure quality of the product. The third step of the training process includes equipment which demands a strong understanding of global project not only required team work and holistic understanding of global project targets, but also shares and relies on the lesson learned in step one and two. The last training category in the process which includes material, process flow analysis, and out puts. All members of the cross functional team may need to attend all training classes offered in all four training steps and insure a qualitative understanding of each training sector. The goal is to move same team through out the project from the first step to the next to achieve better quality product, create cost and duration reduction opportunities and better implement flexibility through out the process of production chain.

Prier to introduction of cross functional team to the firms in the business of developing new product, the sequence of traditional approach would start from firm's customer service and marketing organization to define and investigate customer product requirements. The design team or process group would investigate the proposal and product would be made. This sequence would be piped to manufacturing group to investigate the changes and produce a manufacturing prototype upon approval. The project would be challenged through finance or firm's accounting group for profitability evaluation and production would start.

The above scenario is a chine of serial processing sequence of event that a group of scattered teams would perform to qualify a product for manufacturing. Each of these group would have their own set of priorities and independent objectives . As product is hand over from one group to the next the evaluation and analysis of approaching decisions involving the same product would vary. In addition, each group used their own expertise to evaluate and reach decisions about the same product. For example, the design group objective would be concentrate on how to design the product and finance would evaluate and collect data on profit margins and rate of return and process manufacturing engineering would worry about how to manufacture the given design.

Today most firms look at the cross functional teams as the new way of developing product for their customers. The team has a great background of cross functional training and is smaller in size. Team would be the main stakeholder of the product definition and typically would own the project from start to Finnish. The cross functional team members have the advantage and resources to do market analysis and be in contact with the customer and identify market needs at the same time the cross functional team has skills required to design the target product and lunch it to the market faster, chipper, and better.

In another words, the designer not only concerns about design methodology and how to achieve a workable design, but he / she would have opinions and expertise to asses design choices based on manufacturablity and capabilities. Also, it would consider the cost of product. The expectation from the process or manufacturing engineer is to use the top line expertise to make the design manufacturable and he / she is a part of the design team as well. As the product gets developed all the members of the team would move the project forward as one body and dedicate more attention to resolve future issues faster. With above explanation, the cross functional team is exported to perform and provide efficiency, coordination, ownership, and dedication through out the project steps.

Skill Set Check List

	Category	Description
1	Basic Math, Physics, Chemistry	Basic knowledge and tasks involving calculations
		Safety
		Physical properties
		Laws of physics
		Chemical interactions
		PC skills
2	Design	safety
		Layout
		Elec, Mech, Arche
		Chemical
		Spec's
3	Equipment / Tools	
		Safety
		Troubleshooting
		Machine components and functions
		PM (preventive maintenance)
		Installation and process guide lines
		Rectification's and modifications
		Start ups / warm downs
		shut downs
		Tool controllers, Software's
		Cleans
		Spec's
4	Process	
		Safety
		Process flow
		Process steps
		Process ties
		capacity
		See (1)
		Spec's
		Material characteristics
		Quality Control
		Yield

Table 2.

Training Project Scope:

To introduce a common skill set component required for cross functional qualification of the biggest asset of a firm which is the firm's direct and indirect employees.

Conclusion

In the frame work of cross functional teams, managers needs to pay special attention to the team's organization and surrounding. To enhance team productivity manger need to communicate priority of all strategic goals, insure team accountability for their performance, increase team members to participate and choose project assignment, balance resources, balance powers, facilitate individual performance plans, provide feed back and facilitate every one for team membership. The best rule of the manager in a cross functional team with no dought would be the supplier / customer rule. This rule will be defined as to develop and oversee the team's resources. By giving the team the power to set the project objectives, budget and select resources, management may target to make the team responsible to carry out results. The cross functional teams carry the characteristic of differentiation and integration as the work progresses which there are conflicting ideas in the sense. The cross functional teams eventhough bounded by the organizational structure and corporate values, they are capable of introduce changes in organization because teams are the forum for exchange expertise required to accomplish project objectives. The team's ideas of integration has a direct effect on the team work efficiency that is a indicator for corporate organization accomplishment. To asses organizational that use cross functional teams, project goals and team objectives needs to be aligned. To increase productivity and decrease team confusion through out the process.