Structured Product Development Processes

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ABSTRACT

Concurrent/Simultaneous engineering goals cannot be realized without the early involvement of both the Marketing and Manufacturing functions. Today, many companies are forming multi-functional teams as a solution to rapid product development goals. Many of these teams receive "team building" training, and then they get the "go signal". It is unrealistic to think that these teams will be significantly more successful than other organizational approaches, without building a process around them that is appropriate for this "new type of organization structure."

Today we will talk about "Concurrent Product Development-CPD™" frameworks that define new organization structures, processes, and tools that have already helped several companies to reduce their time-to-market and better satisfy the needs of their customers and the marketplace. Six areas will be addressed.

- Balanced resources in functional organizations
- Dedicated teams which act as a single entity
- Concept and product filters
- Milestone-driven development process
- Early and concurrent functional activities
- Robust product definition

BALANCED RESOURCES

How many people should we have in that function? How many people should be working on new product development [NPD]? How many people should be designing, and how many people should be checking the design? These are frequently asked questions that few managers have good answers for.

There are right answers. They depend on what industry one is in, and on how fast a product must get to market.

By definition, we are discussing resources that are involved or dedicated to new product development. Take, for example, a company that makes automated test equipment [ATE]. Key NPD functions include: Marketing, Design Engineering, Manufacturing Engineering, Software Engineering, Software Quality Assurance {SQA], and Purchasing. Knowing the proper staffing ratios between these functions is key to long term success. Notice that the word "ratios" is introduced. Ratios allow this approach to be scaled to any size organization.

Begin by baselining your company. Count percentages of each person that are "dedicated to new product development." Some people will be fully dedicated, some people will be only 10% in each functional group. Add up all the individual percentages in each department to get a total "full time equivalent" count, then calculate the ratios. The engineering and/or software functions should always be in the numerator.

$$\frac{\text{Engineering}}{\text{Manufacturing Engineering}}$$

$$\frac{\text{Software}}{\text{SQA}}$$

Goldense Group and our close affiliate "Product Development Consulting" [Cambridge, MA] have benchmarked numerous companies in the US and Japan. The ratios are surprising. In one best-in-class survey, as compared to industry-average, consumer electronics companies had a 8:1 Engineering:Marketing ratio, and 4:1 Engineering:MfgEngineering ratio. Many companies that are striving to improve their

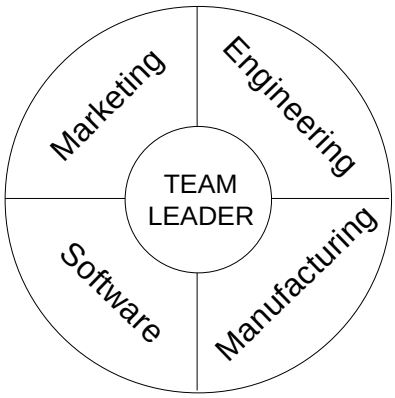
process have 20-50:1 and 15-30:1 respectively before they begin concurrent product development initiatives.

DEDICATED TEAMS

The implementation of teams stresses most functional or matrixed organization structures. Managers are concerned about "owning headcount." Individuals are concerned about getting too far outside their organization structure. Team-based approaches offer few simple answers, but a company can have it both ways if it plans properly.

Three structures are required for effective teams: physical, organizational, and review/reward. This presentation examines only the physical structures.

Teams should be physically collocated. If this is not possible, then they should attempt to achieve virtual collocation. Physical collocation says that all dedicated/core team members should sit together in the same place. Further, they should be surrounded by the facilities that they need to develop the product.



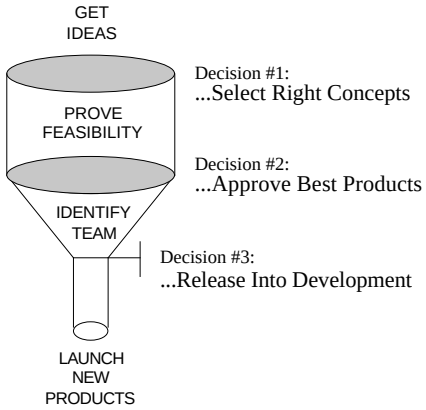
In the electronics industry, as in most industries in the 1990's, this would include immediate access to all engineering design and project information systems. A dedicated terminal on every team member desk. A lab area to construct breadboards and tinker should be adjacent to the team offices. There should be a conference room for the sole use of the team. Resident in the project system should be every piece of documentation that the team produced, or uses as a reference. If teams are split by great geographic distances, then video-conferencing and office communications tools should be plentiful and travel budgets should be planned for.

The subject of the Keynote address at the 1990 AT&T DFX Conference was collocation. AT&T found that the "probability of communication decreases 80% when team members are more than 50 yards apart." This is not so surprising. Think for a minute where some of the most valuable knowledge, that we all have, comes from. We "overhear" it from people within earshot as we go through our working days. If NPD team members are in close proximity, they will learn about all aspects of the product they are developing together.

CONCEPT & PRODUCT FILTERS

Generating ideas, turning them into the right concepts, proving feasibility, and funding the best products from the right concepts are business critical issues. Every company hopes to have 40-70% of its revenues from products that were developed and launched within the past three years.

The rate and way in which companies process ideas through their "idea factory" distinguishes them in the marketplace. It is not only necessary to develop approved products rapidly in the 1990's, companies must also get the right ideas into the pipeline at an ever increasing rate.



At each decision point, the "holders of strategy and funding" meet face-to-face with the team that is presenting the concept or funding proposal. Dialogue is open between the senior executives

and the team members. Proponents and dissenters on the executive team must voice their views and discuss them. A decision must be made at the conclusion of the presentation by the team. The reasons and rationale must be communicated in person, and a memo documenting the results must follow the meeting within a day. Not everything that the Japanese do is for us here in America, but rapid decision making is one lesson we should learn.

There are many ways to achieve rapid idea flow, but they must all provide for:

1) The rapid transference of business strategy into the hands of the idea people and NPD functions.

2) A face-to-face decision making process between the key company executives that set and/or fund R&D and new product strategies.

3) Robust product definition and project planning efforts that give teams comfort that they can achieve the goals of their product and project plans.

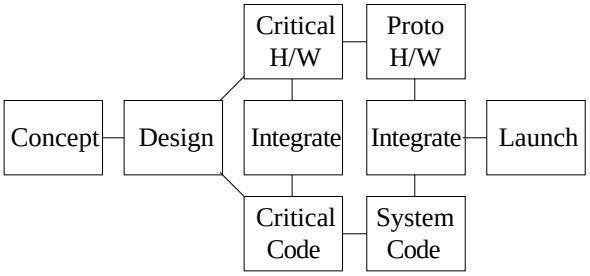
4) Active management of personnel and a sense of timing about when to release approved programs into the product development phase.

MILESTONE-DRIVEN PROCESS

Concurrency contrarians are concerned about too much structure. It is often equated to the popular words "standards" and "control." While contrarians do make some good points, most of them eventually concede that a structured and consistent process that delivers reliable products that meet customer needs in less time is worth the structure.

In order to understand the magic of structured processes, one must understand the importance of a common lingo at all levels in the company. Milestone-driven processes, typically 6-10 steps in length, are easily remembered by everyone. Once the key milestones are determined, they become a framework in which to relate all other aspects of product development. They serve to place activities at a point, or small range, in time. They serve as a focal point by which activities must be completed to avert risk and unexpected surprises downstream in the product development cycle. They most importantly serve as a common communications vehicle by which every person in the company can stay abreast of development activities in and across projects.

The ATE company described earlier in this article might have a milestone process that emphasized the importance of managing the parallel development of hardware and software, with some key integration checkpoints along the way.



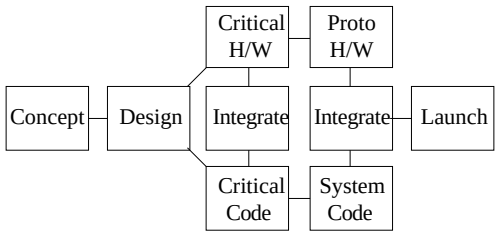
Design reviews, technical reviews, customer and internal specification documents, testing specifications, safety and environmental analyses, reliability plans and other key development activities and documentation become associated with each milestone. In a short period of time, the structured process becomes a framework in which everyone shares a common view of the necessary steps to achieve successful product development.

CONCURRENT TEAM ACTIVITIES

The early involvement of all critical functions that are required for any given product is essential. If one analyzes the project staffing approaches of best-in-class companies, one finds that they consistently have early involvement and ramp up fast. Poor product developers typically achieve full project staffing about 50-60% of the way through the development effort. The best approach is to achieve full staffing about 20-40% of the way through.

The "Function-Milestone Matrix [FMM™]" is a useful tool to use as a first step to determining project staffing. The FMM "lists the key activities that each function must perform in order

to complete the requirements of the milestone." Once the activities have been identified, and analyzed to insure that each activity occurs as early in the process as possible, it is relatively easy to estimate the staffing requirements necessary to complete the tasks.



MKT				
H/W ENG				
S/W ENG				
MFG ENG				
PUR				

The functions will differ at each company.

The FMM typically consumes six or seven pieces of paper, and defines the minimum set of activities that must take place. It serves as a guide to concurrency and project staffing. It is also a tremendous tool to integrate new people into a project, and to bring brand-new employees up the learning curve rapidly as to what is expected of them.

The advanced concurrent engineering practitioner may have noticed that the word "phase" or "phased development" did not appear in this article. The FMM incorporates phases, but focuses on milestones. Phases occur over time, milestones occur at a point in time.

ROBUST PRODUCT DEFINITION

Product definition is a topic that continuously escapes the focus of even the best product development companies. The body of knowledge that exists at the present time is filled with holes, and lacks a "continuous thread" that ties all the different definition activities together.

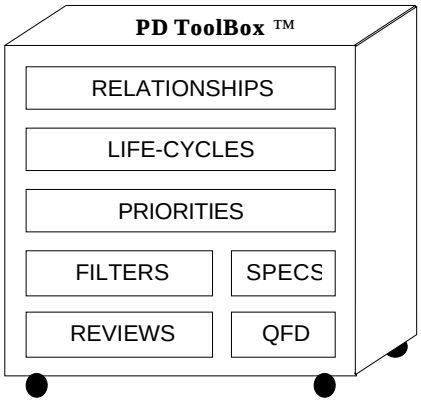
Goldense Group predicts that it will be a "field of study unto itself" by the mid-1990's. Right now, companies are ranting and raving to learn QFD methodologies believed to be in widespread use in Japan. Product Development Consulting recently completed a second benchmarking study in Japan. The study focused on four "household name" electronics companies. None of these companies used QFD, only two had heard of it.

Product specification documents are the vehicle that once carried US products to world leadership positions. It may be time to go back to "what we know" and simply upgrade this approach to meet 1990's requirements.

Five product specification documents, would capture the results and decisions of product definition efforts.

- External Customer Specification
- Architectural Product Specification
- Internal Product Specification
- Product Testing Specification
- Market Launch Specification

A series of tools and procedures, would be used to "cull the information out" for the purpose of documenting it via specifications.



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Brad Goldense is Founder and President of Goldense Group, Inc. [GGI], a ten-year old Cambridge, Massachusetts consulting and education firm focused in advancing business and technology management practices in line management functions

Mr. Goldense has consulted to over 50 of the Fortune 1000 and has worked on productivity improvement and automation projects in over 150 manufacturing locations. Clients are across North America, Europe, and the Middle East. Sematech, Abbott Laboratories, Sikorsky Aircraft, Carrier Corporation, Molex, Monsanto, and Bose Corporation are included in his client list.

Prior to founding GGI in 1985, Mr. Goldense worked for CSC/Index, Price Waterhouse, and Texas Instruments in engineering and manufacturing positions.

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