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Feature

Many studies point to the fact that those new products that are most successful are also those characterized by the shortest time-to-market. Clearly, adopting a time-compressed development strategy should improve success and profitability. How a time-compression approach to new product development should be implemented, however, is a less-clear topic. This article discusses the need for a cohesive and comprehensive strategy for new product development, stressing the importance of concurrency and the simultaneous application of a range of proven techniques. It discusses the areas that impact most on time and profitability and discusses methodologies to maximize efficiency in those areas.

Driving Forces For Product Development Speed

Brad Goldense and David Vermette, Goldense Group Inc.

In the last years of the 1980s product developers began to turn their attention toward a new competitive dimension: time. No longer would product cost or development cost dominate the planning of new products. This new focus on product development cycle time was brought about by a number of factors. Average product life cycles have decreased while global competition has increased, leading to an increase in customer alternatives. At the same time, industry consolidation has become rampant — causing less competitive companies to be swallowed up. In this new environment, market share is often won by early visibility within a market segment. In simple terms: *the company that gets to the finish line first wins.* A corollary: *"better expensive than late."* Over the past several years a number of tools and techniques have been introduced that promise to decrease cycle time — these include CAD, Design for Manufacturing, Quality Function Deployment, and the use of cross-functional teams. Taken in isolation, as "turn-key" solutions, none of these will deliver faster Time-To-Market. The new situation of the 1990s demands a new understanding of how to manage product development, beginning with an analysis of the forces driving product development speed. Successful managers should ask: what are these forces? how can they be measured? and how can they be leveraged to produce competitive advantage?

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Why is Time-to-Market So Important?

In the mid 1980s McKinsey and Co. published a landmark study on product development for competitive markets. The study built on the well-known fact that in a competitive environment the company that gets to the marketplace first garners two-thirds of the market. When a new competitor moves into the market segment the price inevitably drops, and then drops again when a third player arrives on the stage Profit drops follow price drops. It follows from this that the "sweet spot" for profitably — the largest market share at the highest revenues per unit — is in the earliest stages of life of a given market.

The McKinsey study showed that those who ship a product six months late lose 33% of their lifetime profit. Product cost was also shown to be a key factor over the lifetime of the product. A product that is 9% over budget will lose 22% of profitability over the life of the product. Development cost — currently the major driver of internal decision making — was shown to be almost insignificant: a massive 50% development cost overrun will result in only a 3.5% loss in total profit.[1] Traditional thinking, which linked profit with low development and manufacturing costs, needs to be altered to reflect the new reality of product development: development speed — meaning fast Time-To-Market — is *the* driver of profitability in the new conditions of competition, with product cost right behind.

The importance of Time-To-Market is brought into clearer focus by the decrease in product lifetimes. In the 1980s, the average product life cycle

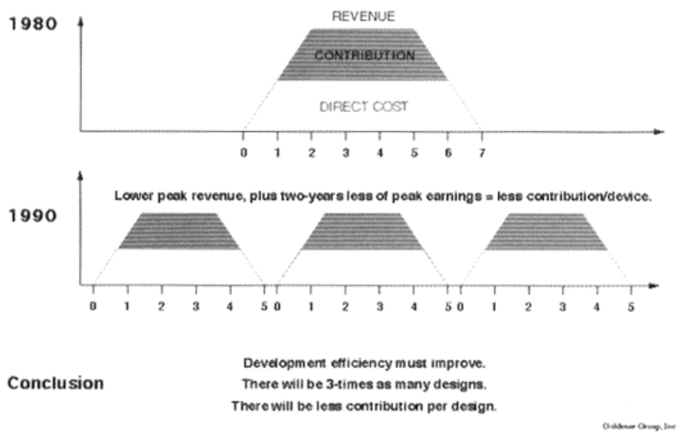

Figure 1. Decrease in Product Life-Cycle and Revenue per Product in the '80s and '90s.

across industries was approximately seven years. New products ramped up to a higher proportional revenue, in less time, and stayed there for a longer period. In the 1990s, product life cycles have diminished to an average of five years, directly reducing revenues per product.

Lower peak revenues and less time at that peak level means less contribution per device. Moving into the late 1990s, two to three times as many new products will have to be designed in a comparable time frame in order to create the same revenues and profits to account for these shorter product life-cycles. (See Figure 1)

Product Selection

Product Selection is one of the major drivers of speed. A "re-engineered" product-development process is worthless if the product concepts going into the development phase are destined to gather dust in the warehouse. Despite the reduction of product life cycles, and the increased competitiveness of the manufacturing world, the failure rate of new product ideas hasn't changed much in 25 years.[2] The cost of these failures is astronomical. According to one study, new product failures account for 46% of all product development costs.[3] The implication is that nearly half of development costs could be recovered by ensuring that only the best ideas go into the pipeline. In the consumer products industries, failure rates approach 90%; in the high tech sector the record is even worse.[4]

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Another study of product selection involving 11,000 new products launched by 77 companies revealed that, on average, 13 new product ideas were proposed to produce one new product winner.[5] Yet another study claims that for every 100 new product ideas, about 27 are tested, 12 introduced and 9 actually succeed, for a ratio of about 11 new ideas per successful product.[4] The question is: how can your organization best generate, define, propose, and review new product ideas to accurately identify the ones that are going to succeed in the marketplace — for certain?

Many organizations make the mistake of trying to change processes without understanding their present situation. This is like trying to find your way on a roadmap without knowing where you're starting from. Efforts to improve product selection begin with the following two steps, which are intended to set reasonable improvement goals and to ensure agreement throughout your team on what needs to be improved.

The first step is to gather data on how your organization is presently selecting new products. One approach is to create case studies of between five and ten new products — successes and failures — examining where the ideas came from, how they were initially defined, and how the process was managed from concept through development. We've all heard the excuses — "the profitable window closed," "the market shrunk," "key people left," "the product cost was too high" — but an objective case study of specific projects will move beyond these generalizations to arrive at the root causes of product selection defects.

The second step is to get some hard numbers on how many new product ideas are proposed, how many of these ideas never make it out of the gate, how many are attempted and then canceled, and how many are put into production. Of those that make it into the hands of customers, measure how many achieve revenues and profits as planned, how many achieve less than planned, and how many never recover the development costs. This data will give you a sense of what percentage of concepts become successful new products and what might be a reasonable target for improvement. Even a 5% increase in product selection accuracy can have a dramatic effect on the bottom line.

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	% DESIGN COST INCURRED	% PRODUCT COST COMMITTED	
Conception	3-5	40-60	90%
Design Engineering	5-8	60-80	
Prototype Testing	8-10	80-90	
Process Planning	10-15	90-95	
Production	15-100	95-100	

Figure 2. Percentage of Product Cost At Various Phases of the Product Development Cycle.

Involve Key Personnel Early

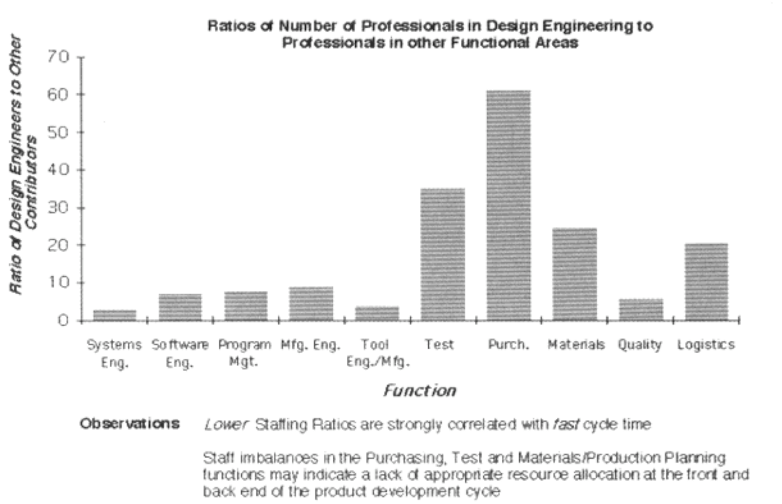
A CAMI study made public in 1990 examined the percentage of product cost determined during the successive phases of the product development cycle.[6] In other words, what percentage of the product cost is "fixed" by the work performed in each phase of the development process. Between 40% and 60% of the product cost is committed during the concept phase of the project. By the end of design, 60% to 80% has been committed and fully 90% of the product cost has been fixed by the end of the prototype testing process (See Figure 2). These findings point out where the savings need to occur in product development: in the earliest phases of the process.

The best way to reduce costs in the early phases of development is to create collocated product development teams who start together from day one. Downstream changes mean downstream costs. From the earliest stages of the process the entire product life cycle must be taken into account from market research data, to reuse of parts, to detailed design, to distribution channels, to packaging, to product delivery, to warranty, to technical support, etc. The earlier each of these aspects of the total product is defined in full detail, the fewer downstream changes will occur and the more efficient and cost effective will be the product development process.

One of the beneficial effects of dedicated Concurrent Product Development teams is a decrease in Engineering Change Orders (ECOs). The cost of ECOs is staggering. According to a case study of a Ricoh Copier, the cost per ECO in early design is $35.[7] The same ECO in late design, prior to prototype costs $177; between late design and start of production the cost goes up to $368 per ECO. After production the cost skyrockets — an ECO after the product is introduced costs $590,000! At that rate one or two ECOs can significantly impact profits, especially if they occur late in the development cycle.

Old-fashioned "over the wall" development processes — sequential "hand-offs" of projects between functional groups — is a recipe for

Figure 3. Ratios of Number of Professionals in Design Engineering to Professionals in Other Functional Areas.



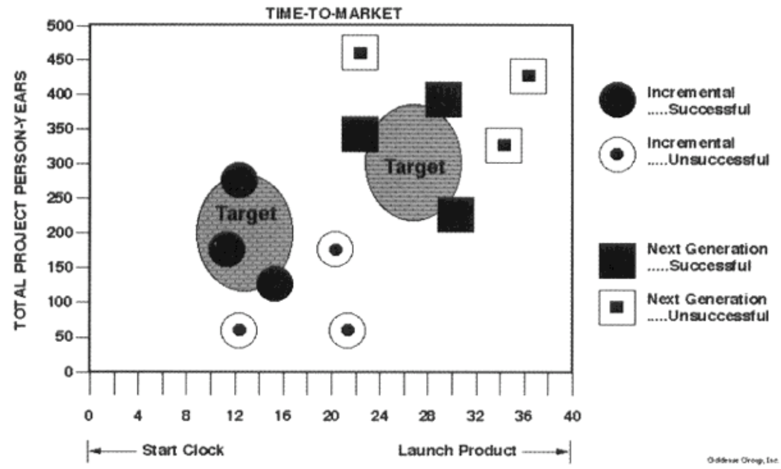


Figure 4. Person-Years by Project Versus Time-To-Market.

generating ECOs. Each "hand-off" involves a lag time, where the new functional group has to come up to speed on each aspect of the new product. Then they begin to make changes, generating ECOs and losing time and money. Time is lost while the new functional group battles a learning curve, and then more time is lost fixing what should have been sketched out on paper in the earliest product definitions. The only proven way to freeze product definitions early and prevent costly changes is through cross-functional Concurrent Product Development teams starting together early.

Proper Resource Allocation

Another leverage point for product development speed is improved resource allocation or capacity management, particularly in the area of project staffing — the proportion of human resources dedicated to new products. Consistently, the research has shown that a relatively low ratio of design engineers to professionals in other functions results in reduced time to market.[8] To take one example, imagine there are two projects with ten design engineers allocated to each. Imagine that one marketing professional is assigned to support both projects. In this scenario the staffing ratio would be 10/.5 or 20:1 for each project. With two projects and 20 engineers to support, there's likely to be a bottleneck in the marketing component for each project. Now imagine that there is one marketing professional dedicated full-time to each project for a staffing ratio of 10:1. Isn't it common sense that the bottleneck will open out or be completely eliminated with one fully dedicated marketing professional, supporting ten design engineers on one project? An example of a staffing ratio calculation is pictured in Figure 3.

Inadequate staffing ratios spread support resources over too many projects, resulting in a non-linear development process. The result is frequent "stops" in the process while one function must catch up with the situation created by his or her colleagues in another function. The overall effect is inefficiency in the design process and slower Time-To-Market. Depending on the industry, ratios of between 6:1 and 1:1 between design engineering and marketing, software and testing have been correlated with faster Time-To-Market.[9] It is not only a question of when each function becomes involved in the process, but how many people become involved and how much they become involved.

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Another way to calibrate resource allocation is by studying case histories of previous products to determine patterns. First, divide incremental products from next generation products. Then determine which in each category could be considered successful and which were unsuccessful. Place these projects on a co-ordinate system where the horizontal axis is time-to-market and the vertical axis is the total project time in person-years (See Figure 4). Experience has shown that successful projects often become grouped around a domain with moderate resource outlays and fast Time-To-Market. This metric can then be applied proactively to predict target project size for future projects. Those that remain in the target range are likely to duplicate the success of their predecessors.

Conclusion

Competition from the standpoint of

time, well-known in manufacturing, is a relatively new concept in product development. Much has been written about this subject in the last ten years, but many researchers approach the topic piecemeal, trumpeting this or that technique that promises radical cycle time reduction. To realistically meet the challenge of reducing Time-To-Market requires the simultaneous application of proven techniques:

- Applying concurrency wherever it makes sense
- Instituting a product-selection process that keeps a sufficient number of new products in the pipeline in order to identify the one concept that will succeed in the market place
- Understanding how the company presently does product selection before changing the process
- Involving key personnel early in the product development process
- Paying attention to resource allocation, particularly for staffing
- analyzing the company's case history of previous products to determine patterns of successful product development programs.

"Experience has shown that successful projects often become grouped around a domain with moderate resource outlays and fast Time-To-Market."

Only by reorienting our thinking from a dollars-based approach to a time-based approach can industry challenges be met and conquered in competitive markets. Focusing on these areas moves the centroid of the activity of product development to the earliest 15-20% of the process. Allocating time to the earliest phases of a project saves proportionally more time and resources in downstream and improves the certainty of project outcomes.

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Biography

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Prior to establishing GGI, he worked for CSC/INDEX as a consultant in business and technology strategy development; Price Waterhouse involved in specifying and implementing application software; Lester B. Knight and Associates specializing in product improvement and cost reduction manufacturing initiatives; and Texas Instruments as a lead engineer and project manager.

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