Reengineering the New Product Introduction Process

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The goal of new product introduction (NPI) is to create new offerings that satisfy customer needs. Achieving timeliness, performance, and price that delight the customer, at a cost that ensures profitability for the suppliers, is the measure of its success. These conditions become increasingly difficult to meet as customer expectations are fueled by advancing technology and growing competition. In this paper, we examine a specific example of NPI reengineering built on time-based competitiveness in Operations Systems. We then generalize from this experience and others within AT&T to compile a set of key best practices for NPI.

Introduction

AT&T Operations Systems, one of five business units in the Network Systems Group, provides global computer applications and data networking products that transform the operation of telecommunications networks into automated, self-healing, revenue-generating assets. The goal of Operations Systems is to be the world's fastest, highest quality provider of easy-to-use networked operations systems. Its 2200 employees are organized across five customer business units, each consisting of one or more strategic business units (SBUs), incorporating a total of 56 product teams. Implementing the Operations Systems NPI process has led to an organization-wide emphasis on speed. Average time-to-market intervals for Operations Systems' products have been cut in half in less than two years.

Processes that lead to continual improvement in time-to-market and understanding of customer needs and costs are key to profitable growth in the 1990s.[1] In the 1980s, NPI was a serial process with many handoffs between organizations and limited customer involvement. From beginning to end, a process could take up to five years—much too long in today's competitive environment and a great drain on cash flow. Using benchmarking[2] and process reengineering, AT&T Operations Systems substantially improved time-to-market intervals and responsiveness to customer needs.

In 1989, Operations Systems conducted a cost and interval benchmarking study to:

- Compare its performance with that of best-in-class (BIC) competitors
- Understand what leads to faster product realization[3]
- Gain insights from the benchmarking study that could be used to improve the structure of the organization and its processes.

The results of the study had a profound effect on the way Operations Systems viewed processes and marked the beginning of an Operations Systems-wide emphasis on speed. Benchmarking, shown in Figure 1, determined that the BIC competitors:

- Were faster than Operations Systems
- Had lower costs and higher profit margins
- Followed consistent, integrated processes, with tighter initial planning
- Implemented efficient processes, with phased outputs and rigid milestones
- Empowered multi-functional teams with ambitious projects and aggressive schedules
- Explicitly addressed platform needs.

Despite the modest yearly improvements shown in Figure 1, Operations Systems' performance lagged significantly behind what was considered the industry's BIC, both in total interval and the components of planning and architecture, development, and delivery. After analyzing the benchmark

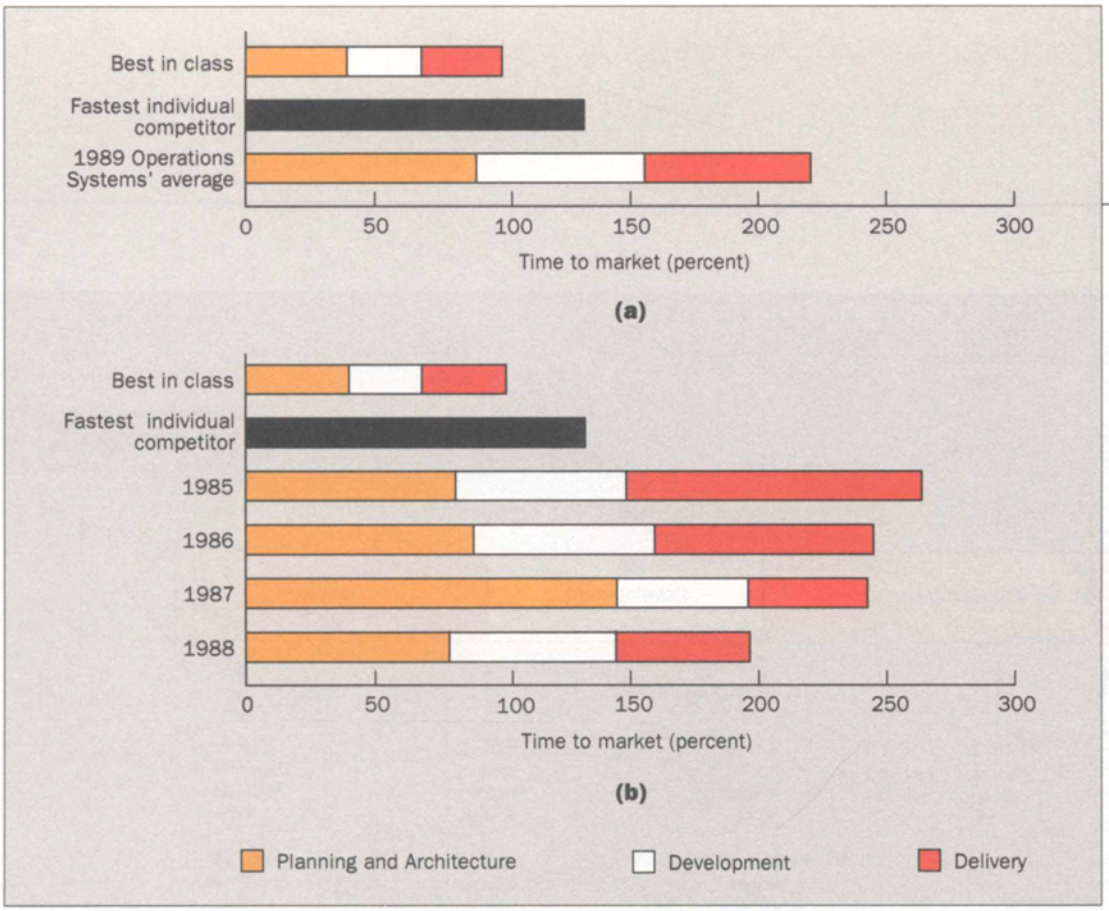

Figure 1. (a) In 1989, average product cycle time for Operations Systems' products was significantly longer than both the fastest individual competitor's performance and the theoretical BIC performance. No single competitor achieved the BIC objective, developed by taking the fastest planning and architecture, development, and delivery phase from each of the benchmarked companies. (b) Operations Systems' interval data, sorted by the year in which the project started. From 1985 to 1988, yearly improvements were modest. To challenge product teams to manage for speed, Operations Systems set a faster time-to-market interval than any of its competitors.

data, Operations Systems developed a strategic objective based on the achievements of the best performers in each phase. While no individual competitor reached this level, it represented a fact-based, ambitious objective for Operations Systems: a 55-percent reduction in average product intervals. This strategic objective quickly became a rallying point for the entire organization. It provided a shared goal for Operations Systems, challenged Operations Systems' product teams to develop breakthrough improvements, and was clear, personal, and market-based.

Following the benchmark study, the leadership of Operations Systems assembled a cross-functional team to act on the study's conclusions. The team, which included nine representatives from all NPI-related disciplines within Operations Systems, was chartered to solve a specific problem, not reinvent the wheel. In this spirit, it drew heavily from other studies, existing AT&T processes, and external processes.

In its early activities, the team identified the root causes of delay, which were people, process, and technology. Most problems were process-related. Finding no single existing process that met the needs of Operations Systems, the team designed the NPI process (see Figure 2).

The resulting process was designed to focus on the customer and increase process speed. It was flexible enough to be tailored to projects of varying complexity and straightforward enough to be implemented. It made extensive use of existing processes, supplemented with peer reviews, on-line checklists, best practices, and on-line business planning tools that addressed specific causes of delay identified by the benchmarking study. Formal feedback and improvement loops that were designed into the process captured knowledge acquired by product teams and made this information accessible to product teams via on-line checklists. Access to these checklists accelerated learning across Operations Systems, reduced the likelihood of making the same mistake twice, and created a repository for the best knowledge of the organization.

Fundamental to the NPI process was the establishment of *gates*, or phased checkpoint reviews (see

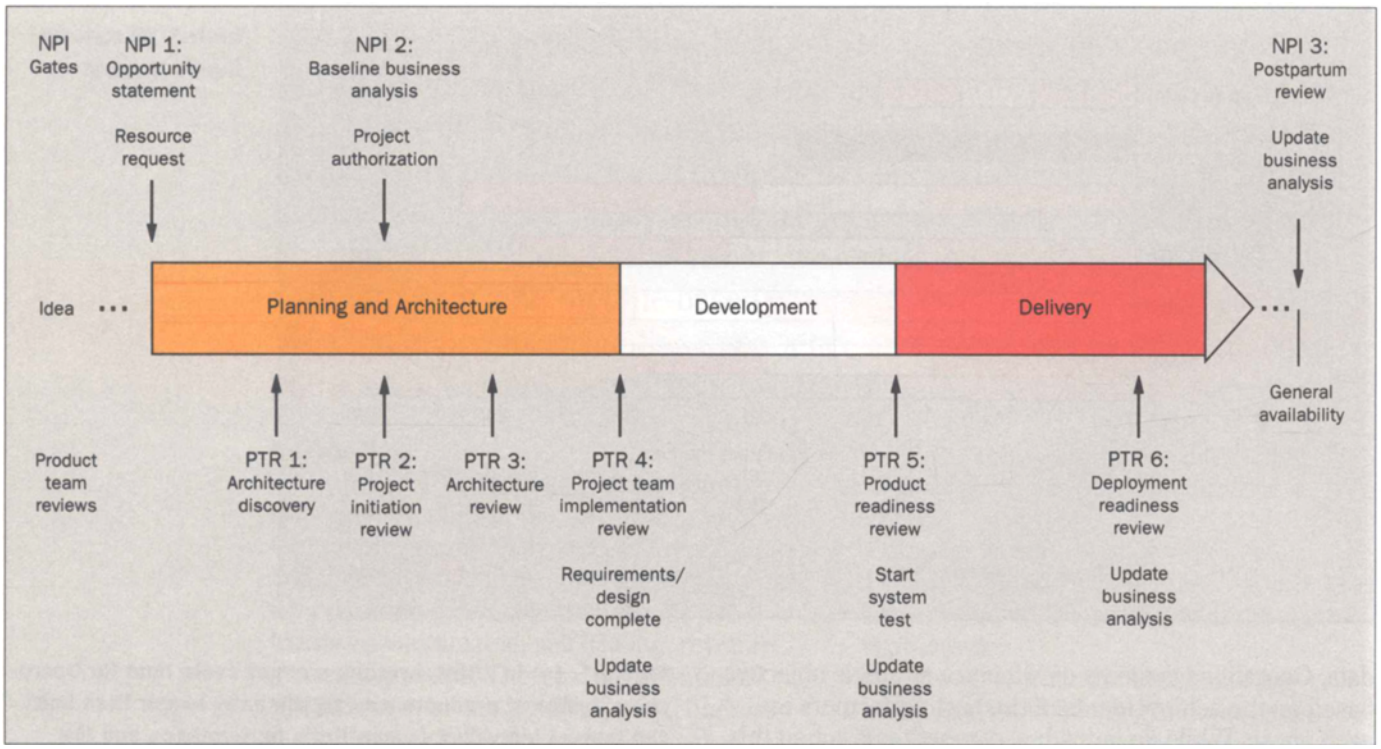

Figure 2. Each of the three phases of the NPI process incorporates one or more NPI gates and/or PTRs. Gates build quality and speed into the process, and PTRs provide checkpoint reviews.

Figure 2), designed to build quality and speed into each stage of the process. Each gate was supported by a comprehensive checklist linked to a particular phase of the project's life cycle. As shown in Table I, each gate had clearly defined inputs and outputs that determined if the idea (project) would be passed to the next decision point.

Product team reviews (PTRs), also known as checkpoint reviews, were incorporated into the process, emphasizing the product development phase of planning and architecture. Here, Operations Systems had the largest gap relative to its competitors (see Figure 1a). This also offered the greatest opportunity to identify and resolve potential problems earlier in the NPI process, and thereby to improve cycle times. As shown in Figure 2, three reviews were scheduled during this phase to address customer, business, and technical needs in preliminary planning. These reviews minimized project risks, highlighted opportunities for reuse, identified new market opportunities, and provided a forum for peers to test and validate assumptions. Intergroup learning and networking are important benefits of these reviews.

The NPI Process

The three phases of the NPI process are planning and architecture, development, and delivery. Each phase incorporates one or more NPI gates and/or PTRs.

Planning and Architecture. In this phase, a product team prepares the opportunity statement (NPI 1) and drafts the baseline business analysis (NPI 2). The PTRs are used to develop the architecture (PTR 1), begin the project (PTR 2), and review the architecture proposed (PTR 3).

NPI 1: The opportunity statement. At the beginning of the NPI process, the product team completes the *opportunity statement*, a high-level description and schedule of the proposed project, customer needs that will be met, and rationale for investment. Accompanying it is the *business analysis resource request*, which identifies resources needed to further investigate project viability by taking it to the next step (i.e., NPI 2). Together, they encourage a timely approve/reject decision from management.

Table I. The NPI Process

NPI gate	PTR	Input	Output
Planning and Architecture NPI 1 – Project start		Opportunity statement Business analysis resource request	Approve/reject Initial funding
	PTR 1 – Architecture discovery	High-level architecture and requirements Architecture discovery checklist	Proposed architecture Reuse potential Recommended BCPs
	PTR 2 – Project initiation review	Architecture discovery readout Project initiation review checklist Draft business analysis	Baseline business analysis
NPI 2 – Project authorization		Baseline business analysis Funding request Project team structure and manager	Approve/reject Project funding
	PTR 3 – Architecture review	Refined architecture proposal Detailed architecture checklist	Architecture readout Reuse sources
Development	PTR 4 – Project team implementation review	Requirements/specifications Project plan checklists Sales/marketing plan checklist Customer support plan checklist	Requirements/specifications freeze Committed project plan Update business analysis
Delivery	PTR 5 – Product readiness review	Product readiness checklist	Update business analysis Update project plan
	PTR 6 – Deployment readiness review	Deployment readiness checklist	Update business analysis Update project plan
NPI 3 – Postpartum review		Postpartum checklist	Update business analysis Best practices/process improvement summary

PTR 1: Architecture discovery. During this review, the product team evaluates the project's high-level requirements with experts who can provide architectural guidance about the product design, technical feasibility, and opportunities for reuse. These experts guide projects through issues of reliability, availability, ease of use, performance, security, error recovery, and operations of the product/system. They also help identify reusable assets to minimize the risk incurred by developing a component from scratch.

PTR 2: Project initiation review. This second peer review expands the opportunity statement into a draft *mini business case*, which further explores business opportunities and risks through analysis, validation, and reassessment of elements affecting the project's viability. This review brings together expertise from various business disciplines to augment the product team and refine the draft mini business case. It helps ensure a thorough understanding of customer and end-user needs, project objectives, and decisions to be made by the team.

NPI 2: Baseline business analysis. Based on the results of PTR 2, the *baseline business analysis*, or mini business case, is now completed and used by management to measure the project against established thresholds, assess opportunities relative to other projects, and ascertain how it will advance business objectives. When approved, this mini business case provides a basis for authorizing total (multi-year) project funding and establishes the formal plan of record. The business case is updated and reviewed at each checkpoint.

PTR 3: Architecture review. The objective of the architecture review is to evaluate the high-level product

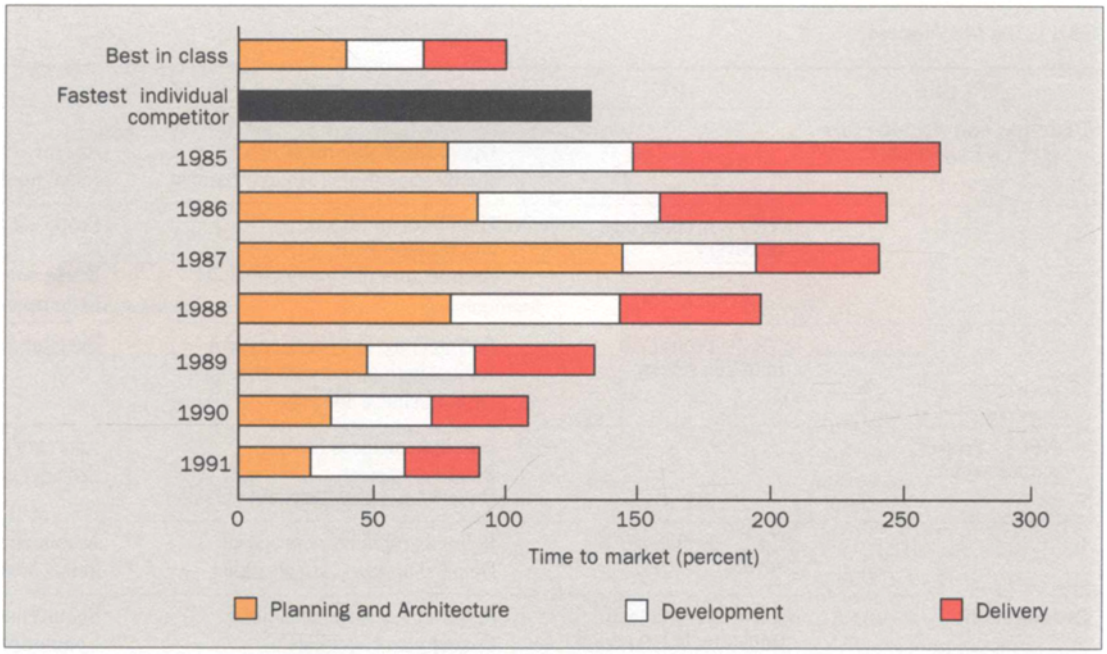

Figure 3. Since the NPI process was introduced, an organization-wide emphasis on speed has led to dramatic yearly improvements in time-to-market intervals of Operations Systems' products.

architecture and describe the hardware and software needed to produce a product that will satisfy customer expectations. This review helps ensure that the system architecture can support the development of high-value features in the shortest possible time while minimizing technical risks.

Development. The development phase begins by freezing the system requirements and specifications. Then, detailed design, coding, integration, and system test activities are performed using best current practices (BCPs). (A best current practice is a documented methodology that has been shown, through benchmarking, to be the most effective way to accomplish a specific step in the development process. In this context, "effectiveness" implies shorter time, lower cost, and/or less rework.) Concurrent with development, support plans are created.

PTR 4: Project team implementation review. The project's final planning review is largely concerned with developing a detailed, committed project plan and sales/marketing and customer support plans. In this review, the product teams establish process ownership and detailed functional responsibilities.

Delivery. After the product and the necessary support plans have been developed, the delivery phase begins.

PTR 5: Product readiness review. This concludes NPI's development phase and begins the delivery phase. Its primary purpose is to verify the overall fitness of the product's software production and hardware manufacturability (e.g., testability, yield). The product is "ready to manufacture" at the conclusion of this step.

PTR 6: Deployment readiness review. The general availability (GA) of the product is the main focus of PTR 6. This review helps guarantee that a quality product is being released, one that meets customer expectations and satisfies product team objectives. At the completion of this review, the product is considered "ready to order."

NPI 3: Process review. In this final stage, the product team examines recent experiences and uses its findings to improve the NPI process and update the NPI checklists. The examination is also a valuable source of input for later projects.

Deployment and Results

In January 1990, the Operations Systems NPI process was deployed to every Operations Systems' product team. Product teams were provided with training, checklists, tools, consultation, and templates. By the end of 1990, Operations Systems had reduced average product intervals by 26 percent. As of December 1991, average product cycle times had been cut to half their original levels, in less than two years (see Figure 3).

The benefits of producing products faster extend

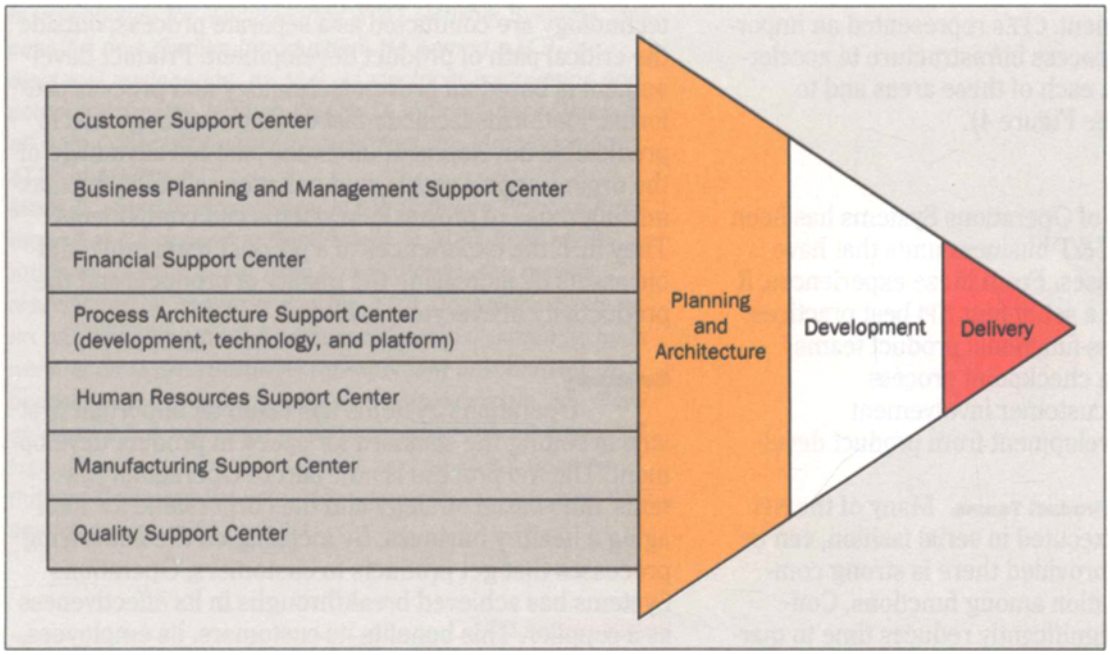

Figure 4. CFEs support faster product development by providing processes, tools, and practices that add value throughout the life cycle of a project.

well beyond customer satisfaction. Higher productivity increased the yield on each dollar of R&D investment and dramatically improved the percentage of revenue from new products, from 34 percent in 1989, to 50 percent in 1990, to 61 percent in 1991. At the same time, Operations Systems also experienced revenue, profit, and market share growth in key areas of its business. A concurrent increase in the use of platforms by product teams not only improved time-to-market intervals, but also increased the reliability of Operations Systems' products. Most important, customers noticed the improved time-to-market performance, as reflected by customers' evaluations (report cards) of Operations Systems' performance.

Success Factors

The rollout of the Operations Systems NPI process was successful because it had a clear, concise goal based on data gathered from customers and competitors. This powerful motivation was linked directly to employees' daily work. They could not just work harder or do the same things a little better; this aggressive goal challenged employees to *beat* the competition.

Operations Systems' planning became more formal, quantitative, and proactive than in the past. From the start, Operations Systems' management insisted that the NPI process be managed with facts. Every project was measured monthly for speed, both the total time-to-market interval and individual planning and architecture, development, and delivery phases. This was coupled with visible, consistent metrics used at every level in the organization and accompanied by formal training in quality methods and techniques. Resultant planning processes were measured and driven by facts, e.g., business cases, NPI decision schedules, etc.

After analyzing the benchmark data, Operations Systems moved quickly to implement the NPI process in small, digestible doses. It focused on developing a practical, flexible process geared to the benchmark findings rather than a perfect, detailed process.

The emphasis on process was supported by organizational and infrastructure changes. Multifunctional product teams with common goals were formed, fully accountable for customer satisfaction and profitability, and sharing equally in product success or failure. Whenever possible, teams were located together, and reward systems were restructured to provide incentives for team performance and cooperation in achieving customer satisfaction, quality, and profitability. These changes empowered the product teams to run their own businesses. In addition, centers of functional excellence (CFEs) were established to provide specific business and technical platforms to

speed product development. CFEs represented an important investment in the process infrastructure to accelerate the rate of change in each of these areas and to improve productivity (see Figure 4).

NPI Best Practices

The experience of Operations Systems has been consistent with other AT&T business units that have reengineered NPI processes. From these experiences, it is possible to generalize a set of four NPI best practices:

- Organize around cross-functional product teams
- Develop a time-driven checkpoint process
- Maintain continuous customer involvement
- Separate platform development from product development.

Cross-Functional Product Teams. Many of the NPI activities, traditionally executed in serial fashion, can be executed concurrently, provided there is strong communication and coordination among functions. Concurrency among tasks significantly reduces time to market. Projects are now organized around small, cross-functional product teams that are empowered and accountable for customer satisfaction and profitability. Small product teams are desirable for several reasons: they communicate and coordinate activities more efficiently, make faster decisions, lower costs, and foster end-to-end involvement of team members.[4]

Time-Driven Checkpoint Process. The time-driven checkpoint process establishes well-defined phases. It incorporates scheduled checkpoints to review and approve movement of a project between phases based on milestone accomplishment, quality, and financial goals. "Time-driven" means that targeted intervals between checkpoints are established to meet quantitative time-to-market goals, ensuring that decisions are made in a timely way.

Continuous Customer Involvement. Before the current NPI process was established, customers were involved at two points in the design and manufacture of a product: formulating product specifications and first customer application. In the new process, customers are involved at each checkpoint to ensure that they are being satisfied. Marketing the product becomes easier, because there are clear customer benefits. Customers are also a key source for new product ideas.

Separating Platform Development from Product Development. This principle ensures that platform development activities involving unpredictable, high-risk technology are conducted as a separate process, outside the critical path of product development. Product development is based on proven technology and process platforms. Platforms facilitate fast decision making, lead to predictable development intervals, take full advantage of the organization's assets, and enhance reliability by maximizing reuse of proven subsystems and components. They turn the experiences of a product team into tangible assets by increasing the quality of products and the productivity of everyone involved.

Summary

Operations Systems has taken an important first step in setting the standard for speed in product development. The NPI process is now part of Operations Systems' time-based strategy and the cornerstone for managing a healthy business. By focusing on the underlying processes that get products to customers, Operations Systems has achieved breakthroughs in its effectiveness as a supplier. This benefits its customers, its employees, and AT&T's shareholders. The employees of Operations Systems are enjoying the rewards of bringing more products and services to market faster than before and improving revenue, profit, and market share gains in key areas of AT&T's business.

To serve its customers better, Operations Systems continues to re-benchmark its processes. This focus on process is paying off. What some may have considered the Achilles' heel of Operations Systems a few years ago has been transformed into a core competency that will fuel customer-focused, profitable growth in the 1990s.

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