

Accelerating the Front End Phase in New Product Development

Jongbae Kim, Assistant Professor, School of Management, Silla University, Korea

David Wilemon, Professor of Marketing and Innovation Management, Director of Innovation Management, Syracuse University

Abstract

In today's accelerated world, most firms competing on the basis of new products need to be proficient in accelerating their product development processes. All areas of the new product development (NPD) process can be improved, but in this paper we focus on the "upfront or fuzzy front-end (FFE)" phase. While a few recent studies note that proficiently performed "front-end activities" can contribute directly to the success of a new product, accelerating this phase has not received the attention needed to develop robust managerial recommendations. In our paper, we review several studies that reveal useful insights into speeding the FFE. We then examine the benefits of accelerating the FFE as well as the challenges encountered. Finally, several methods to speed the FFE phase will be advanced.

Introduction

The environment for new product development (NPD) in most technologically advanced industries suggests that the difficulties and uncertainties associated with NPD are increasing along with the pressure to develop more new products. Rolling out new, technically challenging products at the right time has been a key success factor for more than a decade (Iansiti, 1993). Improving the speed and efficiency of product development can be a powerful competitive advantage (e.g., McDonough and Barczak, 1991; Millson, Raj and Wilemon, 1992). In this paper, we focus on accelerating the "upfront or fuzzy front-end (FFE)" phase prior to actual development. Here, new product ideas gain the justification, plans, and support leading to their approval and subsequent development or they are dropped, licensed, or shelved (Khurana and Rosenthal, 1997).

Interestingly, the FFE phase is a neglected topic in the NPD literature. Instead, the literature has often concentrated on improving the efficiency of the overall process (Murphy and Kumar, 1997). However, the FFE is a largely untapped source of cycle time reduction (Smith and Reinertsen, 1992, 1998).

As noted, the FFE is critical to the success of a new product (e.g., Cooper, 1988, 1998; Dwyer and Mellor, 1991; McGuinness and Conway, 1989). The prime goals pursued in this "upfront" phase are selecting the right opportunity, producing a well-defined product concept and clarifying customer and project requirements prior to development (e.g., Cooper, 1993; Moenart *et al.*, 1995; Murphy and Kumar, 1997). Experienced developers know that it is easy to invest considerable time and money in the FFE, before determining whether a product is even viable (Lester, 1998). Smith and Reinertsen (1998), for example, note that half of the typical product development cycle time vanishes

before development is even authorized. Mabert *et al.* (1992) also note that additional time reductions of perhaps 30% can be achieved by concentrating on the initial phase of the development while management is deciding whether or not to proceed. Moreover, the FFE phase often characterized by trial-and-error has an intrinsically high failure rate (e.g., Stevens and Burley, 1997). This high failure rate places pressure on cycle-time reduction as a primary goal of development process improvement (Smith, Herbein and Morris, 1999). Thus, competence in managing and accelerating the FFE has become a major asset to NPD management.

In order to accelerate the FFE, knowledge of the factors influencing product development speed is needed. Thus, we first review several studies on product development cycle-time and then we examine FFE characteristics. We then examine the benefits as well as the challenges encountered in attempting to speed the FFE. Finally, several managerial suggestions will be advanced.

Studies On the Speed of NPD Process and the FFE Phase

Published research involving NPD cycle acceleration is meager. Much of the research has focused on the development and manufacturing phase, and to a lesser degree the design phase (Millson, Raj and Wilemon, 1992). Studies on product development speed can be distinguished in terms of performance measures (Kessler and Chakrabarti, 1996), methodological approaches (e.g., conceptual works, case studies, or empirical studies), and industry experiences. Table 1 summarizes the findings of these studies.

Table 1. Selected Studies on Speed in NPD

Study	Sample	Context	Performance Measure	Key Results (Important Factors)
McDonough and Spital (1984)	12 NPD projects	3 companies	Speed of Development	Successful rapid development projects are: 1. Highly visible within the firm and strongly supported by senior management 2. Kept on schedule through clear delineation of product specifications 3. Managed by technical leaders who possess not only technical skills but also general business skills.
Gold (1987)	Personal Experience		Speed of Development	Speeding up product development can be accomplished through reliance on external sources of advances, intensified internal R&D programs, and innovative R&D management strategies.

Rosenau (1988)	Personal Experience		Speed of Development	Short focused development phases, management involvement and support, procurement and use of productivity improvement, multifunctional teamwork, distraction reduction, frozen specifications, and microcomputer-based project management software
Gupta and Wilemon (1990)	38 key participants in NPD projects	12 large technology-based firms in U.S.	Speed of Development	<ol style="list-style-type: none"> 1. Active, visible senior management commitment 2. Early involvement of functional groups 3. New work-style 4. Early market/technical testing 5. Effective new product organizations
McDonough and Barczak (1991)	30 new product development projects	12 British Companies	Speed of Development (Design phase: 'the degree to which a project was ahead, on, or behind schedule')	<ol style="list-style-type: none"> 1. Leadership style influences speed of development. 2. Source of the technologies employed moderates the relationship.
Mabert et al. (1992)	A comparative case study of six new product introduction projects at six different firms		Speed of Development	<ol style="list-style-type: none"> 1. The project needs a knowledgeable team leader. 2. The team approach – with members from all relevant disciplines in close proximity – reduces communication delay, etc. 3. The development effort should reflect a recognized organizational commitment.
Lynn et al. (1999)	95 successful and unsuccessful new product projects	U.S. (90% were considered high-technology industries)	Speed to Market (measured by 4 items, e.g., 'comparing speed with the major competitor for a similar product')	<ol style="list-style-type: none"> 1. Having a long-term view of product development 2. Following a rigorous NPD process
Kessler and Chakrabarti (1999)	75 new product development projects	Ten large firms in several industries	Innovation Speed (defined as the time elapsed between (a) initial development efforts and (b) ultimate commercialization)	<ol style="list-style-type: none"> 1. Clear time-goals, longer tenure among team members, and parallel development increased speed 2. Design for manufacturability, frequent product testing, and computer-aided design systems decreased speed 3. Different factors were found to influence the speed of radical and incremental projects
Dyer, Gupta and Wilemon (1999)	182 PDMA members	Technology-based firms in U.S.	Time to develop new product and Satisfaction with new	<ol style="list-style-type: none"> 1. Dedicated team structures strongly relate to first-to-market and fast-follower firms

			product process	<p>2. First-to-market cite “difficulty in defining product/market” as chief cause of delays.</p> <p>3. Difficulty in product/market definition, poor interdepartmental relations, and preoccupation with other responsibilities contribute to delays.</p>
--	--	--	-----------------	---

Based on the Table 1, factors influencing the development speed can be categorized by the project, the project team (e.g., leadership style, tenure, team structure), organizational support (e.g., senior management commitment, inter-departmental cooperation), proficiency in NPD management, etc. Many of the findings based on the development phase also can be transferred to the FFE phase. However, during the FFE, different activities are performed under different situations, therefore, suitable acceleration methods need to be developed based on knowledge of the FFE phase.

FFE phase can be defined as the period between when an opportunity is first considered and when an idea is judged ready for development (Kim and Wilemon, 1999). During the FFE, the organization formulates a concept of the product and determines whether or not it will invest resources to develop the idea (Moenart *et al.*, 1995). Specifically, the FFE includes product strategy formulation and communication, opportunity identification and assessment, idea generation, product definition, project planning, and executive reviews (e.g., Cooper, 1988; Khurana and Rosenthal, 1998; Murphy and Kumar, 1997). These FFE activities usually emphasize seeking knowledge, learning, creating, and experimenting.

The distinct feature of the FFE is fuzziness, ambiguity, and uncertainty. Decisions and activities in the FFE phase are often performed in an environment where unknown factors are plentiful. Information for decision-making is usually informal and approximate in nature rather than quantitative, formal and precise. Fuzziness comes from uncertainty about technology, customer requirements, markets, required resources, company-fit, capabilities, and company limits, such information is necessary to decide whether or not to develop the product. The fuzziness or ambiguity about the feasibility and the quality (commercialization potential) of an idea usually prevents an opportunity in the front-end from proceeding to the development phase. After all, most activities in the FFE focus on reducing the ambiguity associated with whether or not to develop an idea. Other features in the FFE involve:

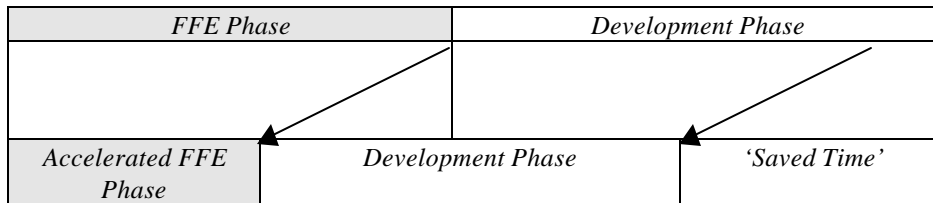
- The actual ‘go/no go’ development decision may be influenced more by non-analytic factors including management’s ‘gut feel’ or intuition (Murphy and Kumar, 1997). Since FFE characteristics are challenging, uncertain, and time consuming, FFE speed can be influenced by the attitudes of the participants, the organizational climate, and resources.
- Activities in the FFE can differ according to a company’s market entry order, e.g., first-to-market, fast-follower, late entrant since the types and the degree of fuzziness encountered in the FFE varies for these different types of firms. Moreover, product life cycles are long in such industries as aerospace, jet engines, and pharmaceuticals, and shorter in industries such

as semiconductors, computers, telecommunications, and instrumentation (Gupta and Wilemon, 1990). Since each project has its own environment, FFE delays can have different meanings.

Benefits Of Accelerating the FFE and Challenges Encountered

One outcome resulting from accelerating the FFE phase is depicted in Figure 1.

Figure 1. Outcomes from Accelerating the FFE Phase

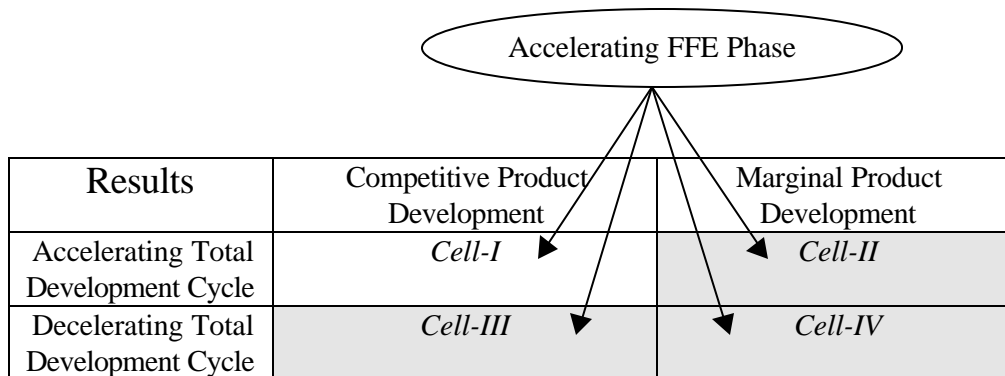


As seen in Figure 1, 'saved time' from FFE acceleration can lead to starting the development phase earlier, which, in turn, leads to a quicker market launch. This faster cycle can create strategic flexibility. These advantages can be profitable to "first-to-market," "fast follower," or even "late entrant" firms. For "first-to-market" firms saved time from accelerating the FFE can increase first-mover advantages (e.g., Aaker, 1995; Lieberman and Montgomery, 1988). On the other hand, for a company facing a situation in which a competitor threatens to take away its current business with a new product, failure to respond rapidly can cause late market entry, a permanent loss of market share, and dissipated profits (McDonough and Spital, 1984). The FFE can vary from a few weeks to several years, depending on project characteristics, the skill of the developers, the technology's readiness, and other circumstances. Saving a few weeks may not seem that critical, however, in highly competitive markets attributing great importance to 'earlier than competitors,' relative FFE time rather than absolute time needs to be considered. Even saving a small amount of time can help companies gain a competitive advantage. In addition to enabling the development phase to start earlier, accelerating the FFE is likely to reduce development cycle-time as follows:

- Considering the internal competition for limited resources, a promising project with an accelerated FFE phase can often preempt required tools, resources, and people.
- Cooperation with qualified suppliers and intermediaries can be accelerated and preempted. Additionally, beginning the development phase early can discourage competitors from developing a similar product.
- Time, effort, and resources saved in the FFE can be invested productively in the development phase.
- An accelerated FFE can highlight the project's importance and attract organizational attention.

Considering these and other potential benefits from FFE acceleration, it is important for product developers to accelerate this phase. However, the contributions of speeding the FFE should be evaluated in the context of the firm's business strategy, the total development cycle, industry developments, and overall NPD performance. In other words, time saved from accelerating the FFE can be meaningful (*Cell-I* in Figure 2) only if it does not degrade the quality outcome of NPD and does not cause the total development cycle to be lengthen. If the acceleration of the FFE is likely to produce *Cell-II~IV*, then acceleration efforts need reevaluating. An important challenge encountered in FFE acceleration is to manage these potential problems.

Figure 2. Results from Accelerating the FFE Phase



Cell-I: Positive result from FFE acceleration

Cell-II~IV: Negative results from poor performance in speeding FFE activities

In order to prevent these potential problems, sufficient preparations must be devoted to the activities that precede the design and development of the product. Studies illustrating the importance of FFE preparation are noted below.

- ‘Poor definition of product requirements’ was the reason most cited for product development delays. About 71% mentioned that the process gets delayed due to poor understanding of customer requirements and insufficient knowledge of a product’s technology and market forces such as competition, suppliers, and distributors, all of which should be accomplished in the FFE (Gupta and Wilemon, 1990).
- Mainframe multichip modules house and connect a computer’s most crucial integrated circuits, affecting the entire system’s speed and reliability. Any change in the multichip module system – for example, the use of a more reliable material in the production of the module’s substrate – can change the entire design and manufacturing process. In turn, these changes can lead to development dead ends, longer product rollouts, and wasted time (Iansiti, 1993).
- Customers not only buy the tangible product but a package that includes the product, the company, the brand image, the sales interaction, the delivery process, after-sales service, and post-sale relationships. The project team should envision and plan for this package early, otherwise it may

ignore downstream requirements and not design products for ease manufacturing, use, distribution, installation, or repairs (Khurana and Rosenthal, 1997).

Influences such as competitive moves, market changes, and internal pressure on new products also can cause problems. Problems and questions not sufficiently treated in the FFE will occur in the development phase and can be barriers to progress which often result in conflicts among functional departments. Prevention of troublesome issues in the FFE is better, less costly, and easier to remedy than in the development phase.

As noted, “undesirable outcomes” result from the acceleration of the FFE when sufficient preparation of a product opportunity has not been made. However, undesirable consequences also are likely to occur when speed is attained at the expense of ‘selecting the right opportunity.’ For example, when “upfront” project teams encounter pressure to speed, they may take a compromising attitude, choosing a less risky but less innovative opportunity (e.g., selecting familiar ideas and/or entering the market late). Such behavior discourages developers from challenging innovative ideas and can lead to poor NPD outcomes. As Quinn (1985) notes, “when reward and control systems neither penalize opportunities missed nor reward risks taken, the results are predictable.”

In conclusion, selecting the right opportunity and preparing sufficiently in the FFE is important when accelerating the FFE. Delay in selecting the right opportunity and preparing sufficiently can, sometimes, be rewarded by the acceleration of subsequent development processes and result in higher NPD outcomes. In background research for our topic one manager told us: “Our team goes 100 mph, the maximum speed of our team, but we would be more effective going 75 mph and be able to see.” However, there are situations where undesirable outcomes from delays in the FFE can be more critical than those from the acceleration of the FFE. Effective decision-making is important and the time required to make choices is valuable. Thus, firms must effectively manage the varied challenges associated with cycle-time reduction in the FFE.

A Model For Accelerating The FFE

In this section, we build a conceptual model to identify ways to accelerate the FFE. The model is based upon a pattern of the “fuzziness level” through NPD. Figure 3 shows that the “fuzziness level” of an idea gradually diminishes as the NPD process progresses. When the fuzziness or uncertainty level descends below the “required” approval level (a) for a specific firm, the idea is usually ready to enter the more concrete development phase. Figure 3, therefore, implies that the “approval level” and the “shape of the fuzzy curve” can affect the speed of the FFE.

The “fuzzy curve” is determined by the characteristic of the opportunity, internal and external uncertainties, and by the activities performed in the FFE. Thus, the fuzziness level is a composite of several factors. While the “beginning fuzziness level” is often determined by the opportunity considered, the subsequent shape is determined by activities performed on the idea in the FFE as well as from external developments, e.g., technological developments, competitor moves, etc. On the other hand, a

company's "approval level" is affected by tolerance for ambiguity, competitive moves, strategy, culture, risk tolerance, and pressure to speed development.

Fuzziness (Uncertainty) Level

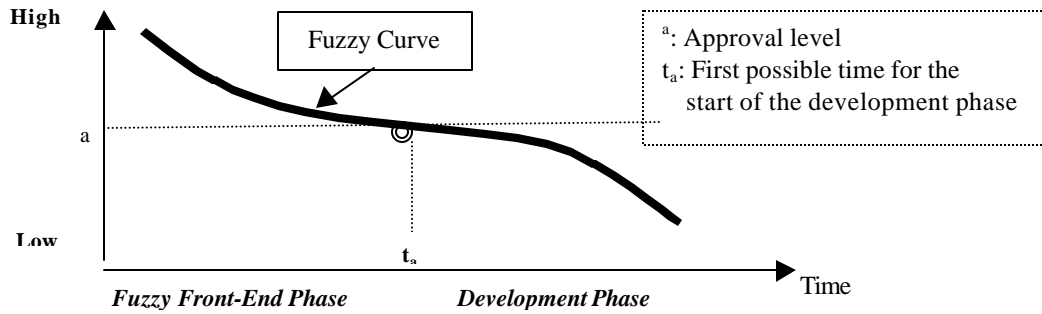


Figure 3. Pattern of the Fuzziness Level through the NPD

Based on Figure 3, we note that there are two major ways to accelerate the FFE phase. One approach is to move the approval level (from 'a' to 'b' in Figure 4) and the other is to change the slope of fuzziness curve (from 'a-curve' to 'b-curve' in Figure 5), both approaches can facilitate the development phase beginning earlier.

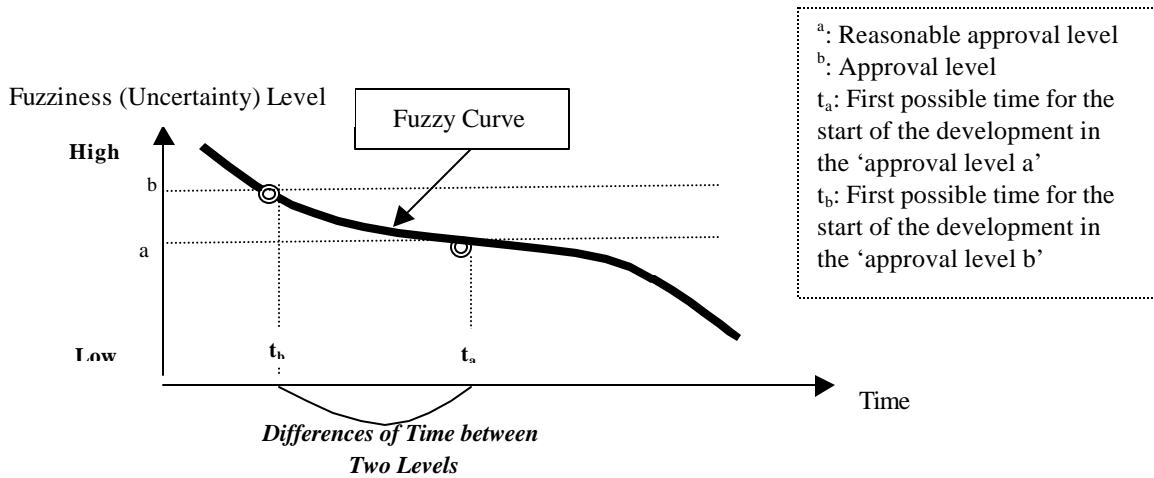


Figure 4. Accelerating Effects by Changing the Criteria Level

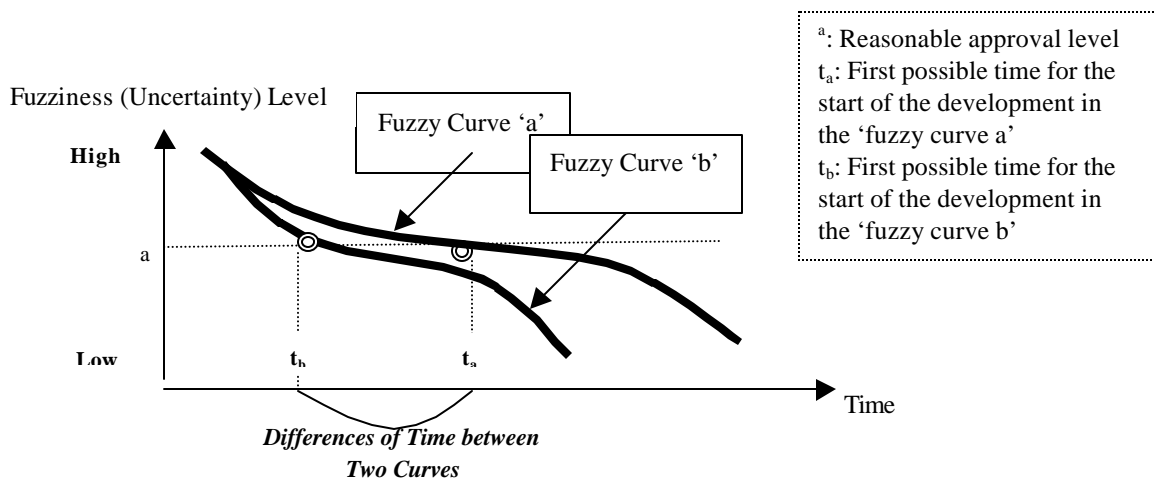


Figure 5. Accelerating by Steepening the Fuzzy Curve

The approval level is often subjective and qualitative and is based on the risk associated with the development of an idea as well as changes in the environment, e.g., the market. Accelerating the FFE by simply shifting up the approval level (as seen in Figure 4), however, is likely to create undesirable outcomes such as the cell-II-IV in Figure 2. Thus, effectively reducing uncertainty can be a desirable way to accelerate the FFE since it can speed the FFE while minimizing the challenges encountered.

Ways To Reduce Uncertainty

The key to improving the probability of success and accelerating the FFE is to identify specific requirements and reduce uncertainties quickly. The faster ideas can be evaluated and the earlier flawed ideas terminated, the more productive the pipeline becomes as idea generators move quickly to new concepts rather than spending energy and resources attempting to resuscitate failing ideas (Smith, Herbein and Morris, 1999).

Reducing uncertainty can be achieved by enhancing proficiency in FFE management. Considering that uncertainties often come from technology, markets, required resources, company-fit and capabilities, and company limits, we also note that fuzziness can result from internal developments and strategies or external market developments. Thus, we classify methods for accelerating the FFE into *enhancing internal FFE competency* and *enhancing external FFE competency*. *Internal FFE competency* implies organizational capabilities to accelerate the FFE and forms the basis for accomplishing each project's specific activities. These include effective developers, project leadership,

resources, and a supportive climate for FFE activities. *External FFE competency*, on the other hand, includes the capabilities to collect and assess market, customer, competitors, and in some cases regulatory information to reduce uncertainty about projects. This includes gathering information from knowledgeable external groups. Several competencies are often required to reduce the fuzziness in the FFE. Our classification can be compared with and reinforces Roberts and Fusfeld (1981) and Khurana and Rosenthal's (1997) classification of *foundation* and *project-specific* elements.

Table 2 summarizes several findings and ideas related to enhancing internal or external competencies (also see Appendix A).

Table 2. Methods to Enhance Internal and External FFE Competency

Enhancing Internal FFE Competency	Enhancing External FFE Competency
<ol style="list-style-type: none"> 1. Assigning committed, knowledgeable team members (Kim and Wilemon, 1999) 2. Organizing dedicated and cross-functional team (Lester, 1998) 3. Creating a holistic FFE process, or aligning FFE (NPD) activities with corporate strategy and balancing new product/technology with the system's existing capabilities (Iansiti, 1993; Khurana and Rosenthal, 1998) 4. Formalizing and documenting the FFE process (Gupta and Wilemon, 1990) 5. Building system to capture the learning from FFE experiences and use the learnings on future projects 6. Setting clear vision, objective (McDonough and Spital, 1984; Millson, Raj and Wilemon, 1992) 7. Performing in a planned and evolutionary way (Smith and Reinertsen, 1992) 8. Using pilot plants and making prototypes in the FFE (Iansiti, 1993; Reinertsen, 1999) 9. Increasing rewards for successful performance (Gold, 1987) 10. Ensuring senior management commitment (Gupta and Wilemon, 1990; Lester, 1998; Rosenau, 1988) 11. Ensuring internal cooperation early (Gupta and Wilemon, 1990; Song and Parry, 1993) 12. Valuing or stressing "speed;" Emphasis on the need for speed 	<ol style="list-style-type: none"> 1. Strong market orientation (Atuahene-Gima, 1995; Dyer, Gupta and Wilemon, 1999) 2. Involving potential customers, lead customers early (Krubasik, 1988; Quinn, 1985; Von Hippel, 1986) 3. Involving experts/consultants early (Lester, 1998; Quinn, 1985) 4. Involving and cooperating with suppliers and/or intermediaries early (Gupta and Wilemon, 1990; Khurana and Rosenthal, 1997). 5. Developing relevant market research techniques to identify emerging market needs. 6. Cooperating with external groups <ul style="list-style-type: none"> - Reliance on external sources for technology through buying, licensing or contracting (Gold, 1987) - Using polling facilities and outside testing labs (Lester, 1998) - Cooperating with competitors such as joint ventures, licensing, and strategic alliances (Kim and Wilemon, 1999) - Global network

Accelerating the FFE via Managing the Approval Process

When a project team reaches a decision that they have selected a promising opportunity this does not automatically imply that the actual development should begin. As Khurana and Rosenthal (1997) note, the FFE is complete when the team presents the business case and the business unit either commits to funding, staffing, and launching the project or kills the project. In too many large firms, a significant percentage of the project leader's time can be spent seeking approvals from senior people (Cooper, 1993). Thus, effectively reducing uncertainties associated with an opportunity alone is not sufficient, since approval delays can detract from the time saved. Accelerating the FFE phase should include making the approval process more efficient (Figure 6). Acceleration results from narrowing the gap between the first possible starting point (t_a) and the actual starting point (t_b).

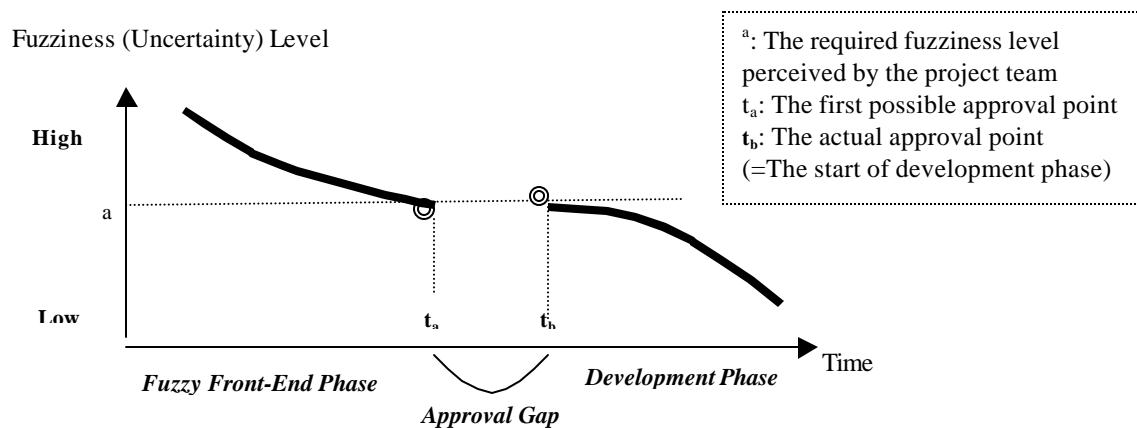


Figure 6. Accelerating Effects via Efficient FFE Approval Procedures

For accelerating this procedure, it is important to identify why there is a time lag. There are several factors influencing why development may be delayed as noted below:

- **Inefficient approval system**

Inefficient organizational systems, unnecessary documentation, and a bureaucratic climate (e.g., Pearson, 1992) can lead to delays. Carefully evaluating how information flows and how decisions are made can identify areas needing improvement. Many companies have found that their approval processes can be made both simpler and faster.

- **Perceptual gap**

Contrary to decisions in the FFE phase, development involves more participants and gaining agreement on the development of an opportunity can take considerable time. Moreover, sociocultural differences between project teams and their senior management/functional groups can create conflicts and delays. For example, their tolerance for ambiguity, professional orientation, time orientation, types of products/projects preferred, and expectations of market changes can be very different (e.g., Gupta, Raj and Wilemon, 1986).

Internal and external situations

Besides inefficient approval processes and perceptual gaps, there also are other factors influencing approval delays:

- Lack of personnel (skill mix), manufacturing limitations, lack of tools
- Unwillingness to cannibalize existing products
- Poor supplier performance/capabilities
- Rapid market/technology changes (e.g., sometimes, a desire to incorporate the latest technological improvement into the product can delay the product's development: Gupta and Wilemon, 1990)
- Lack of capacity to accommodate new products in the distribution pipeline.

In order to fully exploit the advantage of FFE 'saved time,' project teams need to consider these factors during the FFE. Moreover, how to gain and accelerate the commitment and involvement of management to potential ideas needs exploration. Project leaders need the capability of 'marketing' ideas within a firm during the FFE. Sharing information, involving key participants, and creating supportive climates are important. Based on these efforts, a project team is more likely to gain senior management support in both the FFE and in the development phase. Such factors as trust in the project leader, communication capabilities, internal networking, past performances (credibility) also is likely to influence this internal marketing capability. How to approve is as influential in the development phase as whether to approve.

Future Research

The major goal of our effort is to highlight the importance of accelerating the FFE and to suggest methods for speeding the FFE. In order to accelerate the FFE phase, understanding the factors influencing FFE speed need to be studied to identify suitable methods for accelerating the FFE. However, as many factors influence the FFE, finding general acceleration methods is difficult. While each FFE case is different, there are common characteristics to most FFE phases. Thus, capturing the learning from FFE experiences and using these leanings on future projects is an important organizational capability. Accumulating and learning from this information can create effective management guidelines for FFE acceleration. The areas noted below can help accelerate the FFE and require additional study.

When does FFE speed become more important?

Speed, quality, and risk are important factors in FFE efforts. The priority given in the FFE to speed depends on the underlying economics of a specific situation (Reinertsen, 1999), the market's predictability and the cost of delay (Smith and Reinertsen, 1998). Considering these variables, a FFE project team needs to make intelligent tradeoffs between a fast procedure and a product's performance in the market. Relatedly, the following issues need to be studied:

- Is speed and quality necessarily a trade-off? How can a firm accelerate the FFE and not adversely affect the quality of the execution of front-end activities?

- What is the relationship between the time required to complete FFE activities and the time needed to develop a product? Are the factors useful in accelerating the FFE similar to those in reducing cycle-time in the development phase?

What factors in the FFE are important?

Decisions as to allocating resources in the FFE and whether to cooperate with external groups should be made based upon knowledge about what factors influence the FFE and which ones are most important. The following issues deserve further studies:

- Where are “bottlenecks” located in the FFE?
- Which sources of fuzziness are most critical – markets, technology, or internal organizational issues? How does the importance attached to each factor vary according to product, organization, and industry?
- Can computer simulations during the FFE help forecast development phase challenges?

Summary

We propose several factors for developers to consider in their efforts to accelerate the FFE. Even though the FFE may be well-managed, there are other factors which may lead to unsuccessful new products, for example, competitor’s developments; development phase failures; poor product launch, etc. However, it is a good bet that the faster and more effectively the FFE is managed, the more successful NPD projects are likely to be. Moreover, the FFE is an area with great potential for return-on-investment. If a firm excels in accelerating the FFE, it may have the capacity to develop and commercialize other new products while competitors are still in their planning stages.

Appendix A

Reducing Fuzziness - Examples from the Literature

- A. Involvement of Customers/Users:** “For several months, I traveled constantly with the vice president for engineering, visiting large and not-so-large electronics manufacturing companies from coast to coast. As we visited with potential customers, we described the characteristics and capabilities of our tentative and fragile product – a computer-aided engineering workstation – and then listened intently and took notes furiously as they explained all the things the product really needed to do and how it might do them, and how, if it did to them, they might just buy it.” (Langeler, 1992) ‘Sandvik, a leading Swedish toolmaking firm, annually sends its R&D personnel to spend a few weeks with customers, not in order to support current sales efforts, but rather to explore future problems with specialists in product and process development as well as in production – thereby gaining time for research to develop advances in time to meet prospective needs.’ (Gold, 1984) Especially, firms that supply components and subassemblies to other corporations must work closely with their major customers in product development (Mabert, Muth and Schmenner, 1992).
- B. Lead Users:** Many experienced big companies (e.g., Boeing, Sony, 3M, and Hewlett-Packard) are relying less on early market research and more on interactive development with lead customers. By working closely with lead customers, development teams learn from their customers’ needs and innovations, and rapidly modify designs and entry strategies based on this information (Quinn, 1985; Krubasik, 1988). Firms can minimize the use of extensive market research studies by quickly getting the product to lead users, obtaining their reactions, and making refinements to the technology (e.g., Cookson, 1988; Gomory and Schmitt, 1988)
- C. Suppliers:** In industries such as textiles, materials or equipment suppliers provide the innovation (Quinn, 1985). In the FFE phase, suppliers’ knowledge of technology, costs, design, and manufacturing lead-times can contribute to accurate product definition and project planning (Khurana and Rosenthal, 1997).
- D. External Information Suppliers:** Answers to some critical questions can only be found outside the company. External market and technical expertise should be used to speed assessment, validation and development of the new products. The need for external assistance can occur due to economics, the necessity for speed in satisfying market needs, or due to the lack of internal technical and/or marketing expertise. This includes existing and potential customers, consultants, commercial laboratories, and university research and development centers (Lester, 1998; Snyder and Blevins, 1986). Such assistance can supplement internal capabilities in dealing with specialized short-term problems.

- E. Experiments with Markets and Technologies:** This approach involves experiments with products (often prototypes) with various users/customers. The purpose is to gain feedback on the viability of the proposed product and attributes desired in the product. Several market segments may be given the opportunity to use and sample the product. The general nature of this approach is experimental.
- F. Staffing the FFE:** Iansiti (1993) noted that system-focused companies form a core group of managers, scientists, and engineers at the earliest stages of the R&D process. This integration team investigates the impacts of various technical choices on the design of the product and on manufacturing. This integration team gradually selects the most promising concepts, considering its feasibility as well as manufacturability, yield, and reliability. The team's main objective is to balance new research from the lab with the manufacturing system's capabilities and capacities.
- G. Organizing FFE Team:** The dedicated and cross-functional team can offer favorable ownership and entrepreneurial characteristics, speed, better decisions, agility, and adaptability (Lester, 1998). Komatsu's managers set specific targets based on outperforming specific competitors along specific dimensions, attacked in a specific sequence. To put each development program into action, they create off-line project teams to break-down internal barriers (Pearson, 1992).
- H. Alliances and Partnerships:** Gold (1987) notes that speeding up product development can be accomplished through reliance on external sources for technology. For example, an increasing number of firms are finding it valuable to draw on the distinctive capabilities of contract R&D firms, such as Arthur D. Little, Battelle, Stanford Research Institute, and others. Gold also notes that it offers full proprietary benefits at costs which may well prove more favorable than attempting to develop a new staff to cope with transitional problems and then having either to disband it or to shift its members into unfamiliar tasks. Millson, Raj and Wilemon (1996) also give several examples how partnering can improve and accelerate development performance.

References

- Aaker, D. A. (1995), *Strategic Market Management*, John Wiley & Sons.
- Atuahene-Gima, K. (1995), "An Exploratory Analysis of the Impact of Market Orientation on New Product Performance: A Contingency Approach," *Journal of Product Innovation Management*, 12(4), 275-293.
- Bonaccorsi, A. and Lipparini, A. (1994), "Strategic Partnerships in New Product Development: An Italian Case Study," *Journal of Product Innovation Management*, 11(2), 134-145.
- Cookson, C. (1988), "Creativity in Reverse," *Across the Board*, 25(11), 50-51.
- Cooper, R. G. (1988), "Predevelopment Activities Determine New Product Success," *Industrial Marketing Management*, 17(3), 237-247.
- Cooper, R. G. (1993), *Winning at New Products: Accelerating from Idea to Launch* (2nd Ed.), Addison-Wesley Publishing Co.
- Cooper, R. G. (1998), "Benchmarking New Product Performance: Results of the Best Practices Study," *European Management Journal*, 16(1), 1-17.
- Dwyer, L. and Mellor, R. (1991), "Organizational Environment, New Product Process Activities, and Project Outcomes," *Journal of Product Innovation Management*, 8(1), 39-48.
- Dyer, B., Gupta, A. K. and Wilemon, D. (1999), "What First-to-Market Companies Do Differently," *Research-Technology Management*, 42(2), 15-21.
- Gold, B. (1984), "Integrating Product Innovation and Market Development to Strengthen Long-Term Planning," *Journal of Product Innovation Management*, 1(3), 173-181.
- Gold, B. (1987), "Approaches to Accelerating Product and Process Development," *Journal of Product Innovation Management*, 4(2), 81-88.
- Gomory, R. E. and Schmitt, R. W. (1988), "Step-by-Step Innovation," *Across the Board*, 25(11), 52-56.
- Gupta, A. K., Raj, S. P. and Wilemon, D. (1986), "A Model for Studying R&D-Marketing Interface in the Product Innovation Process," *Journal of Marketing*, 50(2), 7-17.
- Gupta, A. K. and Wilemon, D. (1990), "Accelerating the Development of Technology-Based New Products," *California Management Review*, 32(2), 24-44.
- Iansiti, M. (1993), "Real-World R&D: Jumping the Product Generation Gap," *Harvard Business Review*, 71, 138-147.
- Kessler, E. H. and Chakrabarti, A. K. (1996), "Innovation Speed: A Conceptual Model of Context, Antecedents, and Outcomes," *Academy of Management Review*, 21(4), 1143-1191.

- Kessler, E. H. and Chakrabarti, A. K. (1999), "Speeding Up the Pace of New Product Development," *Journal of Product Innovation Management*, 16(3), 231-247.
- Khurana, A. and Rosenthal, S. R. (1997), "Integrating the Fuzzy Front End of New Product Development," *Sloan Management Review*, 38(2), 103-120.
- Khurana, A. and Rosenthal, S. R. (1998), "Towards Holistic "Front Ends" in New Product Development," *Journal of Product Innovation Management*, 15(1), 57-74.
- Kim, J. and Wilemon, D. (1999), "Managing the Fuzzy Front-End of the New Product Development Process," Proceedings (Vol.2), *PICMET '99*.
- Krubasik, E. G. (1988), "Customize Your Product Development," *Harvard Business Review*, 66, 46-50.
- Langelier, G. H. (1992), "The Vision Trap," *Harvard Business Review*, 70, 46-55.
- Lester, D. H. (1998), "Critical Success Factors for New Product Development," *Research-Technology Management*, 41(1), 36-43.
- Lieberman, M. B. and Montgomery, D. (1988), "First-Mover Advantages," *Strategic Management Journal*, 9, 41-58.
- Lynn, G. S., Abel, K. D., Valentine, W. S. and Wright, R. C. (1999), "Key Factors in Increasing Speed to Market and Improving New Product Success Rates," *Industrial Marketing Management*, 28(4), 319-326.
- Mabert, V. A., Muth, J. F. and Schmenner, R. W. (1992), "Collapsing New Product Development Times: Six Case Studies," *Journal of Product Innovation Management*, 9(3), 200-212.
- McDonough, E. F., III and Spital, F. C. (1984), "Quick-Response New Product Development," *Harvard Business Review*, 62, 52-62.
- McDonough, E. F., III and Barczak, G. (1991), "Speeding Up New Product Development: The Effects of Leadership Style and Source of Technology," *Journal of Product Innovation Management*, 8(3), 203-211.
- McGuinness, N. W. and Conway, A. H. (1989), "Managing the Search for New Product Concepts: A Strategic Approach," *R&D Management*, 19, 297-308.
- Millson, M. R., Raj, S. P. and Wilemon, D. (1992), "A Survey of Major Approaches for Accelerating New Product Development," *Journal of Product Innovation Management*, 9(1), 53-69.
- Millson, M. R., Raj, S. P. and Wilemon, D. (1996), "Strategic Partnering for Developing New Products," *Research Technology Management*, 39(3), 41-59.
- Moenart, R. K., De Meyer, A., Souder, W. E. and Deschoolmeester, D. (1995), "R&D/Marketing Communication during the Fuzzy Front-End," *IEEE Transactions on Engineering Management*, 42(3), 243-258.

- Murphy, S. A. and Kumar, V. (1997), "The Front End of New Product Development: A Canadian Survey," *R&D Management*, 27(1), 5-15.
- Pearson, A. E. (1992), "Corporate Redemption and the Seven Deadly Sins," *Harvard Business Review*, 70, 65-75.
- Quinn, J. B. (1985), "Managing Innovation: Controlled Chaos," *Harvard Business Review*, 63, 73-84.
- Reinertsen, D. G. (1999), "Taking the Fuzziness Out of the Fuzzy Front End," *Research Technology Management*, 42(6), 25-31.
- Roberts, E. B. and Fusfeld, A. R. (1981), "Staffing the Innovative Technology-Based Organization," *Sloan Management Review*, 22, 19-34.
- Rosenau, M. D., Jr. (1988), "From Experience Faster New Product Development," *Journal of Product Innovation Management*, 5(2), 150-153.
- Smith, G. R., Herbein, W. C. and Morris, R. C. (1999), "Front-End Innovation at AlliedSignal and Alcoa," *Research-Technology Management*, 42(6), 15-24.
- Smith, P. G. and Reinertsen, D. G. (1992), "Shortening the Product Development Cycle," *Research Technology Management*, 35(3), 44-49.
- Smith, P. G. and Reinertsen, D. G. (1998), *Developing Products in Half the Time: New Rules, New Tools* (2nd Ed.), New York: John Wiley & Sons.
- Snyder, D. R. and Blevins, D. E. (1986), "Business and University Technical Research Cooperation: Some Important Issues," *Journal of Product Innovation Management*, 3(2), 136-144.
- Song, X. M. and Parry, M. E. (1993), "How the Japanese Manage the R&D-Marketing Interface," *Research-Technology Management*, 36(4), 32-38.
- Stevens, G. A. and Burley, J. R. (1997), "3,000 Raw Ideas = 1 Commercial Success!" *Research-Technology Management*, 40(3), 16-27.
- Von Hippel, E. (1986), "Lead Users: A Source of Novel Product Concepts," *Management Science*, 32, 791-805.

Title: Accelerating the Front End Phase in New Product Development

Jongbae Kim, Assistant Professor at the School of Management at Silla University, Korea
Dr. Kim is currently a Visiting Scholar at Syracuse University. He is a member of the Korean Marketing Association and the Korean Association of Business Administration.

David Wilemon, Professor of Marketing and Innovation Management, Director of Innovation Management, Syracuse University
Dr. Wilemon is a member of the American Marketing Association, Engineering Management Society, Product Development and Management Association, and INFORMS.

Address correspondence to Jongbae Kim, Visiting Scholar, Innovation Management Program, School of Management, Syracuse University, Syracuse, NY 13244.
(e-mail: jkim35@som.syr.edu, Phone: 315-443-4885, Fax: 315-443-5457)