

DISSIMILAR NEW PRODUCT PACE: PRODUCT CONTINGENCY EFFECTS

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The objective of this article is to conceptually examine the appropriate pace of new product development (NPD) and its influences on company financial success while considering the contingency effects of product typology. A conceptual model is set forth to analyze the antecedences of fast NPD, the consequences of fast NPD, and the moderator effects of product type. This paper theorizes that a dissimilar NPD pace is appropriate for high vs. low-tech new products in the dimension of incremental vs. radical new products for the purpose of new product success. It also provides practical insights and strategies into managing a proper level of NPD speed to maximize the financial success of different types of new products.

INTRODUCTION

Is fast-paced new product development invariably desirable? Currently, time-based strategies are in fashion for numerous companies worldwide. In turn, academics and practitioners have carried out numerous studies of fast-paced NPD. In this regard, researchers have analyzed such relationships as NPD performance and time to market (Calantone et al. 1997; Chen et al. 2005); how to speed up NPD (Kessler and Chakrabarti 1999; Langerak and Hultink 2005); the antecedents and outcomes of fast-paced NPD (Kessler and Charrabarti 1996; Menon et al. 2002); and NPD in different countries (Atuahene-Gima and Li 2000; Yu 2010). Further, researchers have evaluated NPD approaches in the high-technology sector (Arnold and Floyd 1997) and marketing strategies for high-tech products (Gardner et al. 2000; Lee et al. 2010).

Although these inquiries have provided insights on rapid NPD, they have typically limited their coverage to approaches for accelerating NPD and the consequences of this course of action. Rarely have researchers analyzed the relative

appropriateness of fast-paced NPD for diverse classes of products. When is fast NPD appropriate for specific managers? Does its effectiveness differ from one product class to another? The purpose of this article is to address these and related issues in the context of (1) high and low tech and (2) incremental and radical innovations.

ADVANTAGES OF FAST-PACED NPD

Numerous marketing practitioners and researchers have offered support for rapid NPD. They proclaim that “speed means profits” (Vesey 1992), or assert that NPD is “better than late” (Blackburn 1991). Many German managers prefer to exceed budgeted levels instead of risking a delay when they make trade-offs favoring NPD (Gupta et al. 1990). Some specific advantages for quick NPD are discussed below.

First, rapid NPD helps firms increase market share or establish the ground work for a new market. Early completion of the concept development process can lead to prompt product attribute convergence between the company and its customers regarding new products. In turn, customers tend to make initial orders from the first to market (Datar et al. 1997) because they desire immediate

possession of these novel offerings (Dumaine 1989). As Menon et al. (2002) have demonstrated, competitors that enter the market by swiftly developing new products can preempt new markets that evolve from emerging customer needs and new technologies.

Second, speedy NPD can improve organizational learning and associated capabilities. Studies (Versey 1992; Blackburn 1991; Menon et al. 2004) have demonstrated that rapid NPD is an important driver of organizational learning. Quick project turnaround times offer organizations multiple opportunities for learning through frequent and early feedback. This assists managers in learning more and faster than its slower competitors. Consequently, the improved learning process can build on itself and improve the next NPD project. The result is a faster and positive “learning loop” with a growing intensive learning process (Kim 2010). Steven and Tracy (2004) assert that organizations learn from customers and competitors, leading to enhanced organizational capabilities, including marketing skills. Also, R&D capability and other operational resources are often improved.

Third, quick NPD can advance profits derived from new products. Researchers have provided empirical evidence that accelerated NPD can improve new product profitability, either by enhanced customer loyalty resulting from switching costs (Dröge et al. 2000; Langerak and Hultink 2005; Reid 2010), or by extended product life cycles and premium prices (Smith and Reinersten 1998). Other experimental studies further demonstrate that time gained by speedy NPD can be converted directly to profit (Blackburn 1991; Lynn, Skov and Abel 1999).

Finally, there are numerous other cited advantages for rapid NPD. It is reported that rapid NPD can improve employee satisfaction and increase management flexibility and responsibility (Hout 1996). Further fast-paced NPD may decrease work redundancy, reduce errors, and foster efficient team communications in an accelerated environment

(Kessler and Bierly 2002). At the same time, not only can fast NPD minimize risks (Langerak and Hultink 2005; Peterson 1994), it can increase the likelihood of completing a full product introduction before imitations from competitors are sufficiently established in the market to impose serious threats (Menon et al. 2002). Finally it has also been shown to increase customer loyalty (Langerak and Hultink 2005).

The list of advantages of NPD reported above is by no means exhaustive. In spite of these cited strengths, fast-paced NPD is not without controversy. Researchers have identified some shortcomings accompanying rapid speed. Crawford (1992) suggests that uncritical application of fast NPD can lead to misuse. The following section sets forth opinions on the disadvantages as discussed by various sources.

DISADVANTAGES OF FAST-PACED NPD

First fast-paced NPD may lead management to neglect customer needs, sacrifice product quality and, as a result, lead to decreases in new product profits. Kessler and Chakrabarti (1996) argue that customer needs may be relegated when speed becomes a major end, rather than a means to success. Further, product quality can be impaired by intentionally skipping product development steps in order to conserve time (Smith 1999). Of course meeting customer needs is a critical feature for product success and profit (Cooper 1980), and this may be neglected if the pace of NPD is unduly accelerated.

Second, fast-paced NPD may overburden and stress NPD team members. Barczak and Wilemon (2003) argue that personnel experience pressure when they focus on speed to market and, in turn, this can be a major source of work stress. Menon (2004) notes that accelerated NPD could lead to stressful workplaces and threaten the organization’s social fabric. For instance, NPD teams might feel overburdened as they are expected to explore speed-conducive development procedures in addition to their existing work-

place demands. Under such circumstances, some employees may suffer undesired consequences. In the same vein, Lukas et al. (2002) assert that NPD speed is positively related to unexpected sources of stress. For example, the lack of market data in the context of reduced NPD time can induce and even force managers to seek new product strategies, which, in turn, may enlarge stress levels.

Last but not least, fast-paced NPD can inadvertently increase expenses and lead to hidden costs. Smith (1999) declares that time reductions can be achieved in two ways: (1) ongoing tradeoffs against other objectives such as project development and product manufacturing costs; and (2) initiating and sustaining organizational changes required to adopt a new approach. Either of these two approaches may increase expenses, some of which are hidden. Several researchers confirm that these hidden costs include: (1) constrained new product innovation arising from fast incremental innovation; (2) increased mistakes resulting from omitting NPD steps; (3) indirect costs originating from the necessary involvement of fringe personnel; (4) inefficiencies resulting from warped product innovation under time pressure; (5) and exhausted resources (Langerak and Hultink 2005; Crawford 1992).

PROPOSITIONS

As has been discussed, fast-paced NPD is associated with various pros and cons. Hence, different researchers and managers hold divergent views on the desirability of NPD velocity. Griffin (2002) claims there are little empirical evidence for the positive relationship between fast-paced NPD and new product success. Ittner and Larcker (1997) report that directly observed evidence for accelerated NPD success was nearly non-existent. On the other hand, some analysts such as Menon et al. (2002) propose that rapid-paced NPD is appropriate in all industry contexts.

In light of the advantages and disadvantages outlined above, the authors suggest that the

requirements for and the consequences of fast-paced NPD are dissimilar depending on product types. Kessler and Chakrabarti (1996) have postulated that the level of NPD speed may be influenced by product characteristics and regulatory environments. This section discusses the relationship between fast-paced NPD antecedences, and the consequences by product types categorized through technology involvement and innovation types. The authors undertake a comparison based on two categorizing dimensions: (1) high vs. low tech products and (2) incremental vs. radical products.

In previous NPD studies, a variety of potential influences have been included as antecedents. In spite of the contribution of these studies, those variables which are appropriate as fast-paced NPD antecedences need to be separated into those which are related to (a) high vs. low tech products and (b) incremental vs. radical products. Some researchers view market uncertainty, competitive volatility, technological uncertainty (Mohr et al. 2005) and shorter product life cycle (Kleingartner and Anderson 1987) as the most notable features that all high-tech industries share. On the other hand, low-tech industries share the following attributes: (1) competition on design, functionality and quality; (2) geographically limited competition; and (3) product attributes that are close to consumer desires (Hansen and Serin 1997). At the same time, innovation involvement differentiates the incremental and radical products (Vermeulen, DeJong and O'Shaughnessy 2005). As such, the most prominent factors that differentiate high vs. low tech products and incremental vs. radical products are: (1) the marketing environment, (2) product features, (3) and the R&D investment. The influences of these factors on fast-paced NPD are discussed in the following section.

As is illustrated by the model set forth in Figure 1, this study indicates how fast-paced NPD involving different product types (high vs. low tech and incremental vs. radical) may affect

new product success in terms of the NPD creativity, customer response and profit.

ANTECEDENCES AND NPD PACE

R&D Contribution and NPD Pace

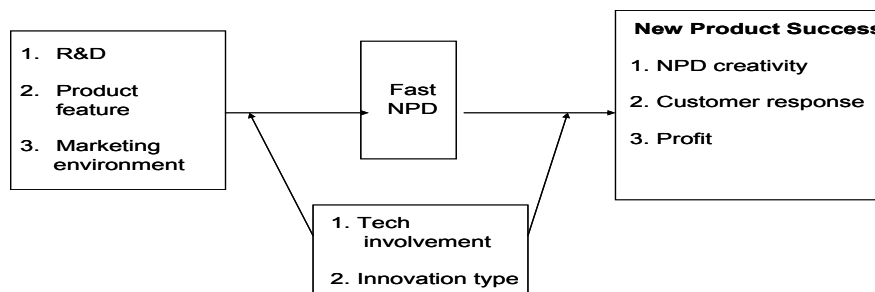
High- tech industry is R&D focused. Jacobson (2004) reports that the high-tech industry is knowledge-intensive and science-based where high-tech innovation emphasizes R&D and codifies knowledge derived from the formal study and training of its people. Further, Hansen and Serin (1997) find that most high-tech products have high R&D expenditures. Significantly, the R&D magnitude reflects the innovative and competitive capability of a company, even when the products are not complex.

R&D contributions dominate the speed magnitude of the high- tech NPD process. Generally, R&D is the prime mover underlying company marketing efforts. Only after innovations are developed are specific commercial applications and targets considered (Shanklin and Ryans 1984). In the main, innovations are derived either through generalization or by adoption from other organizations (Ziggers 2005). Further, high-tech firms generally do not outsource their core technical works in order to deter imitation, although they sometimes outsource manufacturing and associated functions. Thus company R&D personnel are the key actors who carry on high-tech continuous innovation. Further, an important characteristic of R&D in

high- tech markets is the learning-by-doing effect competitors find difficult to imitate merely by purchasing know- how (Dutta et al. 1999). Therefore, high-tech product rivalry is essentially R&D-based or technology-based. The performance of R&D personnel such as scientists, engineers, designers and technicians essentially determines high tech NPD speed, even though communication between R&D and Marketing and Product Planning Departments is necessary in the process.

Conversely, competition in low tech products is not usually focused on R&D levels. Rather, R&D is only one aspect of an innovative system (Jacobson 2004). Schmierl et al. (2004) relate that most low tech companies depend moderately on scientific inputs. Rather, low tech innovation is associated with tacit knowledge derived from experience that is fostered through interpersonal interactions. Sometimes low tech innovations use codified knowledge, employ engineers and undertake R&D. Yet, the use of scientifically educated and highly skilled people with advanced knowledge and design skills is relegated because such skills are not generally needed (Jacobson 2004). Hansen and Serin (1997) suggest that R&D is not a standard requisite for low-tech innovation. They see market exchanges creating an “embodied knowledge” in the form of products, machines or raw materials which plays a central role in low-tech innovation. Therefore, low tech product innovation significantly depends on personnel experience, logistics, marketing and material resources, rather than R&D contributions.

FIGURE 1
Fast-Paced Conceptual Model



From this, the authors propose the following:

Proposition 1: Internal R&D contribution is the determinant factor of fast-paced NPD for high-tech incremental and radical products but not for low-tech incremental and radical products.

Product Feature, Marketing Environment and NPD Pace

The product characteristics and market environments for high-tech products such as computers and pharmaceuticals differ from low-tech products such as hand soap and breakfast cereals. First, the high tech product itself is at least somewhat unique. Some studies (Murmah 1994; Schoonhoven et al. 1990) suggest that projects requiring a substantial degree of change experience slow development, whereas projects with moderate degrees of change experience rapid development. Hence, high-tech new products are associated with relatively slow development speed because of their radical change characteristics.

High tech markets have more technical and market uncertainty and competitive volatility than low tech markets. Researchers find that high tech markets are complex and information intensive (Heide and Weiss 1995). Of course, information patterns are difficult to obtain from the unpredictable high tech market with its short product life cycles. Meaningful data series are often incomplete or do not exist in these fast changing markets (Lynn, Schnaars and Skob 1999). Also, rapid technological change renders collected information time sensitive (Bourgeois and Eisenhardt, 1988). Generally, time sensitive information forces consumers to rely on existing vendors at the initial choice stage (Heide and Weiss 1995). Further, numerous buyer uncertainties exist in this sector. Theories of uncertainty resolution predict that buyers are stimulated to collect information about new vendors at the consideration stage of purchase in fast technology change environments (Heide and Weiss 1995). Thus, market environments dictate where fast-paced NPD is critical and why it leads to more success for high tech than

for low tech companies. Brown and Eisenhardt (1995) find that speed is much more important to organizational success in high velocity than in slow-moving markets. The conflict of slow product development and volatile market conditions for high-tech products implies that fast-paced NPD is urgent to high-tech firms. Thus, the authors propose:

Proposition 2: Product features and market environments force fast NPD to an appropriate level for high-tech radical and incremental products to maximize product success.

It is apparent that low-tech products have low mimic barriers. These products are often marketed with strategies that are not difficult for competitors to emulate. Specifically, rivals can often duplicate their raw materials, human resources, marketing efforts and low technology conditions. In this regard, a hasty-imitation strategy may substantially narrow a competitor's pioneering advantages (Kessler and Chakrabarti 1996). Consequently, fast-paced NPD may not significantly favor the success of low-tech new products.

The result is that low-tech product markets are relatively stable and rivalry involving NPD speed is less intensive than in high tech markets. In such a market, new product quality and customer need fulfillment are more critical than fast-paced NPD for success. Nijssen and his colleagues (1995) show that companies cannot gain significant advantages solely by briskly bringing new products to market, if the new products do not match customer needs. Further, in the case of low-tech and inexpensive offerings such as breakfast cereals and hand soap, customer preference is unlikely to change frequently. Consequently, managers cannot rely upon a trivial alteration in new product attributes or performance to significantly alter consumer purchase behavior or substantially impact the sales volume of existing products. Therefore, sales for low-tech innovations are likely to be satisfactory if management is more concerned about product quality and customer need fulfillment than about fast-paced NPD. Based on this review, the authors expect:

Proposition 3: Product features designed to meet customer needs rather than fast-paced NPD is a more appropriate strategy for low-tech radical and incremental offerings.

CONSEQUENCES OF FAST-PACED NPD

NPD Creativity

Increased marketing capability resulting from fast-paced NPD can enhance NPD creativity. In this regard, rapid NPD can improve the firm's marketing capability through enhanced learning opportunities (Steven and Tracy 2004). In turn, improved marketing capability assists management in understanding consumers and competitors (Sandmeire et al. 2010). Research by Im and Workman (2004) show that adopting a customer orientation relates to improved monitoring of customer needs and improving new product meaningfulness for consumers. It also leads to a better understanding of competitors and assists in positioning new products that differ from the offerings of rivals. The results are improved new product meaningfulness that is unique and novel to consumers. According to Amabile (1993), an important feature of this process is improved creativity for the firm that paves the way for the production of more useful and novel ideas for further new products. Thus, a byproduct of fast-paced NPD is improved firm creativity.

Pressure for fast-paced NPD can also advance creativity. As was mentioned in the previous sections, rapid NPD can engender stress among essential personnel. However, stress is not always a negative ingredient. Stress can be a motivator in some instances (Kahn et al. 1964). The "Theory in use" indicates that competitiveness motivates personnel to exert high levels of effort. Some researchers see a positive relationship between time stress and creativity. Amabile (1988) points out that a certain degree of pressure is positively associated with creative thinking when the tasks are perceived as urgent and intellectually challenging. Other studies (Andrews and Farris 1972; Amabile 1993; Sun and Zhao 2010) demonstrate that necessary concomitant time

pressure is positively related to intrinsic motivation and creativity in R&D scientists. Even under extreme time pressure, creative thinking is more likely as personnel understand the objectives and why completing the job on time is crucial (Amabile et al. 2002). From this perspective, the authors propose that fast-paced NPD time pressure can engender creative thinking.

Proposition 4: Fast-paced NPD motivates new product success for all high and low tech radical and incremental products, as reflected in NPD team members' creativity.

Fast-Paced NPD and Customer Response

Fast-paced NPD would not necessarily enhance customer response as significantly for high and low tech incremental products as it would for high and low tech radical products. First, most high and low-tech incremental new products are extensions of earlier successful radical new products. As such, customer response for products which are incrementally improved is cumulative because the consumer base for incremental new products is already established.

Second, the major role of incremental products is to sustain or improve market share by better satisfying consumers, rather than an attempt to penetrate a new market through fast-paced NPD. Yadav et al. (2006) demonstrated that incremental new products are critical to maintain or enhance mainstream market share. Andrews and Smith (1996) support this and have argued that incremental new products are the main sources of most firms' revenues. Therefore, accessing consumer needs and sustaining the initial successful customer response by enhancing what was previously a radical new product tends to be more essential than rapid NPD for incremental new products.

As discussed above, the role of radical new products differs from that of incremental new products. Managers are confronted with considerable uncertainty when introducing radical new products (Montaguti et al. 2002). They are investing in sweeping innovation for

future technology and production (Tushman and Anderson 1986). These companies pursue new opportunities rather than immediate success by introducing differential radical innovations in an attempt to offer something that resonates with consumers. In this process, getting products to market as soon as possible that satisfy consumers and preempt competition are the primary goals. Of course managers expect a number of failures, but the intent is to achieve an adequate volume of successful new products. Some companies may partner with others to accelerate the NPD process for offering new products faster to assist in seizing market share and setting entry barriers for potential competitors.

Finally, both customer adoption and purchase of successful incremental new products are rather quick, no matter the pace of NPD. In this regard, customer familiarity and past use of these products are the key factors in influencing the adoption process (Moreau 2001). Customers can identify advantages or disadvantages of incremental products more easily than they can for radical new products because of their prior knowledge of existing offerings. Further, less time is needed to uncover information and to learn how to use the product because incremental innovation is less novel than radical innovation. Hence, the time period between awareness of an incremental new product and the decision to adopt the offering may be short. As Wiorkowski and Gylys (2006) have noted, the introduction period tends to be abbreviated or almost non-existent when a product has a clear advantage in features over a company pioneer product.

However, the key factors influencing customer evaluations of radical new products differ from those of incremental new products. Radical new products are pioneers lacking direct alternatives for comparison and are often beyond the experience range of most potential customers. Lack of product familiarity, its use, uncertainty, and perceived risk are important factors that impact the radical new product adoption processes (Veryzer Jr. 1998). In this context, customers seek new information and require

additional knowledge before reaching a purchasing decision.

Of course, radical new product information search time is often limited. The economics of information theory supports the idea that consumers ordinarily take steps to be informed, because information search is a costly and demanding undertaking (Stigler 1996). Also, household production theory suggests that consumers often make initial investments in learning and expect an efficiency payoff in repeated decision-related activities (Michael and Becker 1973). During subsequent periods they are less motivated to conduct ongoing information search (Urbany et al. 1996). Consequently, customers may be inclined to purchase well-established products or products that others seem to be adopting rapidly. Hence, consumers may quickly respond to the first radical new offering. In this case, accelerating NPD can significantly improve and meet customer response for radical new products. From the above analysis, the authors propose that:

Proposition 5A: Fast-paced NPD is a determinant factor of new product success for high and low tech radical new products, as reflected in favorable consumer response.

Proposition 5B: Fast-paced NPD is not a determinant factor of new product success for both high and low tech incremental new products, as reflected in favorable consumer response.

Fast-Paced NPD and NPD Profit

Improved creativity accompanied by increased meaningfulness to consumers and novelty originating from fast NPD can increase customer response. This seems to be the case since customer response is primarily determined by the degree to which a product provides meaningful benefits, as compared to competing alternatives (Cooper 1986). One study (Srivastava et al. 1998) reports that rapid consumer response produces greater cash flows and results in increased profit for the company.

Since high tech products are more radical (Lynn et al. 1999A), these new products should generate more profit from fast-paced NPD than low tech new products.

Since fast-paced NPD probably contributes less profits for low-tech than for high-tech products, it is expected that moderate NPD speed results in superior profits for low tech radical and incremental products. This is also expected for high tech incremental products at the beginning, but there can be a threshold where profits will stabilize and then decrease. For high tech radical products, the faster the NPD, the more successful the high tech new product is likely to be. The authors propose the following propositions:

Proposition 6A: Increased NPD creativity can increase (1) customer response, and (2) new product profitability for all products.

Proposition 6B: Fast-paced NPD generates (1) the largest profit flows for high tech radical products, and (2) the least profit flows for low tech incremental products among the four types of products.

Proposition 6C: The relationship between fast-paced NPD and profit for high tech radical products is depicted by a concave u profile from above. The functional structure is steep.

Proposition 6D: The relationship between fast NPD and profits for low tech incremental products assumes a concave u profile from above. In turn, the functional structure is somewhat flat.

DISCUSSION

The speed of new product development has become an important field of interest to both academics and practitioners (Reid 2010; Lee, Kang, Yang, and Lin 2010; Grönlind, Sjödin and Frishammar, 2010). Much of the previous research on this topic has been limited to the importance and benefits of fast-paced NPD. This paper's contribution is to suggest that product-dependent considerations should be

introduced when studying NPD speed. The focus is to conceptualize the role of NPD speed for various types of products across diverse marketing environments. By assessing R&D contributions, product features market environments, NPD team creativity, and customer responses for high and low tech radical and incremental offerings, it appears that a different new product development pace is appropriate for high-tech versus low-tech products. Fast-paced NPD probably contributes the largest profit for high tech radical products among the four types of offerings. Further, NPD speed and profit levels are likely to assume a concave from above u configuration for this type of products. However, moderate NPD speed can be expected to bring about superior profits to all low tech products and high tech incremental products. The functional structure for the profit of these three types of products is predicted to be flatter than that for high tech radical products in the context of fast-paced NPD speed.

The authors' perspective can be of benefit to marketing practitioners. First, the propositions set forth in this paper may be helpful in understanding the consequences of various NPD paces on different types of products. Second, they can guide marketing managers when they desire to avail themselves of fast-paced NPD. Managers of both high and low tech products should recognize that new product profits from a fast-paced NPD may have a threshold beyond which an accelerated pace will not yield a corresponding increase in profits. As a practical matter, the concave profile of NPD speed and profits for both high-tech and low-tech products imply that management is well advised to gain an understanding of the conventional NPD pace in the industry before arriving at the desired rate. However, this sort of knowledge and insight is time and product sensitive. As a general rule, managers may benefit through comprehensive analyses of rival strategies and the market before developing new product strategy and tactics. Finally, the inputs from the study may help practitioners develop understandings that will assist in generating appropriate NPD

strategies for high vs. low tech and for incremental vs. radical new products. For instance, managers in high-tech industries might emphasize R&D contribution and continuous improvement in R&D skills to improve NPD speed and profitability. Conversely, managers in low-tech industries should emphasize the inter-functional communication between the R&D and the marketing departments, in addition to NPD speed, in order to incorporate customer needs on new product timing to maximize profitability.

FUTURE RESEARCH AND LIMITATIONS

The views presented here regarding NPD speed for different types of products are the first step in exploring several selected dimensions of NPD strategies and profitability. Certainly, fast-paced NPD is not an obvious managerial choice. Further research efforts may be of value in examining means of balancing marketing strategies with the consideration of fast-paced NPD for maximizing profits of high tech vs. low tech and incremental vs. radical new products. Future research may also be useful in exploring avenues for quantifying each germane factor, such as new product speed and customer response, which influences the profitability of high tech and low tech new products. It may be useful to quantify each factor such as R&D investment and product features that impact the different NPD paces for different kinds of new products. For example, when considering how to leverage product attributes for profitability, what is the appropriate NPD speed needed to achieve the thresholds that maximize profits for all types of products?

Other questions relate to: How to properly balance divergent influences to maximize profits? What are the appropriate R&D investments and how should managers determine their contributions to both high tech and low tech products? How does NPD pace relate to customer responses for a radical high-tech product? Other opportunities for future

research are to determine the importance of NPD speed for other types of new products. For instance, is fast-paced NPD equally important for consumer products and for industrial products?

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