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**Research Paper**

**The Effect of Acceleration Techniques on Product Development  
Time**

**by**

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## **I. Background**

Increasing competition between companies and the never ceasing race to introduce new products has made it essential for the agile manufacturers and producers of such items to bring their products to market with the least loss of time. Bringing to market products faster than their rivals allows a technical pioneer to realize higher profit gains, but only if it has been able to rapidly respond to any customer feedback in an expedient manner and has succeeded in setting new and improved product standards [13].

Agile manufacturers have found that the only sure way to capture the market in its infancy is to bring their products to the attention of customers as soon as possible. 'Hitting it while the iron is hot' seems to be the motto followed by manufacturers of today's competitive firms. This competition is more fierce in the electronics industry today than in any other particular segment of the economy. Just as various companies have their own marketing styles, they also have their own techniques for accelerating the product development time.

Even though effective product development requires an appropriate mix of resources; people, money and time to deliver the product features desired, this paper only takes into consideration the effectiveness of the techniques utilized to reduce the time required [13].

The research conducted by Zirger and Hartley looks into the more commonly utilized acceleration techniques in a sample set of electronics companies.

## **II. Concept**

Zirger and Hartley in their paper have set out to identify whether the use of the commonly known and utilized product development acceleration techniques have any effect on the fast development of products or not. They have identified three main factors that affect the development time performance. The factors and their sub categories that have known to have a direct affect on the acceleration of product development as defined by Zirger and Hartley [13] in their paper are:

1. **Product Strategy**
  - Incremental Development
  - Part Reduction
2. **Development Process**
  - Overlapping

- Freezing Design
- Supplier Reduction
- Supplier Involvement

### 3. **Team Structure**

- Cross Functional
- Dedicated
- Co-Located
- Empowered
- Time As A Goal
- Management Support

Through their use of tests developed by Zirger and Hartley, they have in their paper studied the relationships between the above techniques and their significance in the product development time reduction.

First, their paper provides a succinct summary of the acceleration techniques that are more commonly used in industry these days. Since their survey and efforts are concentrated towards product development in electronics companies, they collected data from participants at a summer education program for executives of the electronics industry.

The paper also discusses the survey research design that is used to measure the relationships between the techniques used in product development acceleration and development cycle time. Finally the paper presents the results and the implications are discussed.

## **III. Methodology**

As pointed out above, the data was collected at a two week long summer seminar for general managers of electronics companies. This particular group of respondents was selected because of their understanding of the product development process and the strategy of the company in particular.

The survey, which had twenty nine questions, covered the topics related to demographics of the company, product strategy, team development and benchmarking. The respondents were asked to utilize a recent product development cycle to answer the questions. Of the 120 surveys sent out, 44 were finally used in the study after all the missing data points had been replaced by variable means.

Zirger and Hartley, as the basis of their research set up various hypotheses, that either refuted the commonly used acceleration techniques or they supported the use of such techniques in showing that the product acceleration time is dependent on the factors noted above and studied in the paper. These hypotheses, evolved directly from the factors that have been used by companies in accelerating product development time and have also been studied by other researchers and their effects analyzed.

Below is a list of the hypotheses that were proposed and studied by Zirger and Hartley in their paper:

**Hypothesis One:** *As the degree of product change decreases, development time increases.*

**Hypothesis Two:** *Decreasing the number of product parts relative to the previous model decreases development time.*

**Hypothesis Three:** *Greater number of overlapped activities decreases development time.*

**Hypothesis Four:** *Freezing the product design early in the development process decreases development time.*

**Hypotheses Five-a:** *Reducing the number of suppliers decreases development cycle time.*

**Hypothesis Five-b:** *Increasing the degree of part design conducted by suppliers decreases development time.*

**Hypothesis Six:** *Increasing the number of functions represented on the development team decreases development time.*

**Hypothesis Seven:** *As the number of projects to which team members are assigned decreases, development time decreases.*

**Hypothesis Eight:** *Co-locating team members decreases development time.*

**Hypothesis Nine-a:** *Decreasing the number of decisions for which approval is required outside the project team decreases development time.*

**Hypothesis Nine-b:** *Increasing the level of senior management support for the team decreases development time.*

**Hypothesis Ten:** *Setting and measuring fast cycle time as an explicit project goal decreases development time.*

## IV. Findings

According to the findings of the authors, they were only able to show the significance of four of the above twelve techniques that are used in product development acceleration to product development time acceleration.

Zirger and Hartley were able to find a direct correlation between fast development of products and organizations that had teams that showed the following characteristics:

- The product development teams were dedicated to the project/product.
- The individual product development teams had members that were cross trained.

- Fast time to market was a product development goal of the teams studied.
- There was an overlapping of development activities in the product development process.

Some of the other noteworthy results obtained by Zirger and Hartley suggest that dedicated team members were often co-located with the core team members.

Apart from this set of inferences, another very important conclusion of the research conducted by Zirger and Hartley was that, using a sporadic combination of factors did not always result in a successful accelerated product development. Though team structure and management variables played a very significant role on product development times.

## **V. Conclusion and Contribution**

Zirger and Hartley have attempted to provide a conclusion to the debate of which acceleration techniques do have a direct impact on the product development time. Their research was undertaken in part to provide the professional in the electronics field with a better understanding of the various techniques and how they can utilize those techniques to their benefit.

What they found was that, the time to market techniques used by various firms are not only very sporadic in use but are also incomplete and inconclusive. The difficulty experienced by various firms in implementing the acceleration techniques was also noted and could be an indication of why they are not universally applied. Another important fact noted was the use of such techniques in only large corporations because of the dearth of management personnel in smaller companies.

In the last paragraph of the paper, Zirger and Hartley bring out the most important point by concluding that the accelerating product to market cannot be achieved by quick fixes and localized solutions. They require constant attention, coordination and a healthy combination of human resource management factors and product strategy [13]. The paper also serves as a crucial study that discusses product development cycle in light of the rich management experience brought to the discussion by the participants in the survey group.

## **VI. Strengths and Weaknesses**

Though the paper provides a good overall study of the topic and is able to bring together the experiences of a large group of industry experts, there are certain areas of the research that would need to be studied in detail for a thorough understanding of the problem at hand. Some of the inconclusive parts of the paper are also identified by Zirger and Hartley.

One of the first areas that strike as a weakness in the paper is the scope of the survey group. The participants selected were all from one group attending a special work session. This would not have provided a completely unbiased sample. Second, the group selected was all from the electronics industry and this paper could have then been written and looked at more from the perspective of product development at electronics companies and not all manufacturers or designers in general.

The target group also consisted mostly of mid-scale to large companies. This is evident from not only the size of the company but also the sales size. The low number of respondents would also then have skewed the results. Since the surveys were from single respondents using self reporting, there was no real option to eliminate any bias. Though various steps were taken by the authors in eliminating some of these bias factors, nevertheless the ultimate effect cannot be discounted. For any future research, it would be worthwhile to take all necessary step to eliminate the research weaknesses mentioned above.

## **VII. Comparison With Other Research**

Although acceleration techniques for product development have been studied on numerous occasions, there still remains separate thoughts on whether they have a direct correlation with the actual compression of 'to market time' or not. LaBahn [8] has studied the same topic and utilized an approach quite similar to Zirger and Hartley. He has applied a similar statistical approach using propositions and then calculated the mean and standard deviations with the correlation mapped out also. The results of his study are consistent with the findings reported by Zirger and Hartley. He concludes that utilizing outside sources/assistance (part design conducted by suppliers) does not improve product development time.

Hull [6] has pointed out the effectiveness of concurrent engineering in the acceleration of product development. Specifically the benefits of synergy

utilized in early simultaneous influence, in process design controls and computer and information technology. Though the last two were not studied by Zirger and Hartley, the first factor is studied by them and is noted to not have a direct relationship with time to market, in fact according to the paper under review, decreases in the degree of product changes were not shown to have a high correlation with product development time.

Hauptman [5] has also shown the importance and effectiveness of cross functional teams in product development. This research is in agreement with the findings of Zirger and Hartley who have also noted the importance of dedicated and cross trained product development teams.

Takeuchi [12] has synthesized six characteristics for the new product development by successful companies. These are; built in instability, self organizing project teams, overlapping development phases, multi-learning, subtle control and organizational transfer of learning. It is interesting to note here that even though the names and phrases might be different, the general thought is in harmony with the findings of Zirger and Hartley.

Fusaro [3] on the other hand argues the importance of more technological drivers for the acceleration of product development. Zirger and Hartley did not approach this important factor and this could be a topic for further evaluation and study since Fusaro did not engage in a scientific study but used the best practices at Motorola and generalized them for the industry.

McIlvaine [10] provides information that is in agreement with Zirger and Hartley. He contends that with the decreasing number of engineering professionals, as a result of a falling birth rate and the aging of the population, engineers will have to work in a team environment that is in contrast with the more traditional, individualistic engineer. But it has shown success when applied to new product development [10].

Gomory [4] presents evidence that does not agree with the findings of Zirger and Hartley. He reports that product development can be accelerated with the use of less complex (smaller number of) parts. In the paper under review, the authors were not able to provide conclusive evidence that the smaller number of parts in the product can accelerate product development, in fact utilizing less parts tends to complicate the remaining parts which could result in larger more complex and time consuming assemblies.

Bower [1] and Krubasik [7] both are in agreement with findings of Zirger and Hartley. Bower contends that for a company to be effective and successful in business, it is essential to keep time to market as a prime goal for product

development. He goes on to describe the short development times at the Toyota Motor Company and how they are a direct result of time to market as a management goal. Krubasik [7] also strengthens the findings of Zirger and Hartley. He outlines the importance of the fact that not all techniques used in product development are capable of being used throughout the industry. His research shows that each company has to have an individual success plan mapped out which might be very different from another company in the same industry. Though this was not studied specifically by Zirger and Hartley in their paper, but nevertheless was recommended as a suitable approach to acceleration techniques for product development time.

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## VIII. References

- [1] J. L. Bower and T. M. Hout, "Fast-Cycle Capability for Competitive Power," *Harvard Business Review*, pp 110-118, Nov-Dec 1988.
- [2] Editorial, *Manufacturing Engineering*, pp 20-22, April 1996.
- [3] J. Fusaro, "Reducing time to market in electronic packaging," *Mechanical Engineering*, pp 70-72, June 1996.
- [4] R. E. Gomory, "From the 'Ladders of Science' to the Product Development Cycle," *Harvard Business Review*, pp 99-105, Nov-Dec 1989.
- [5] O. Hauptman and K. K. Hirji, "The influence of Process Concurrency on Project Outcomes in Product Development: An Empirical Study of Cross-Functional Teams," *IEEE Transactions on Engineering Management*, Vol. 43, No. 2, May 1996.
- [6] F. M. Hull, P. D. Collins and J. K. Liker, "Composite Forms of Organizations as a Strategy for Concurrent Engineering Effectiveness," *IEEE Transactions on Engineering Management*, Vol. 43, No. 2, pp 133-141, May 1996.
- [7] E. G. Krubasik, "Customize Your Product Development," *Harvard Business Review*, pp 46-52, Nov-Dec 1988.
- [8] D. W. LaBahn, A. Ali and R. Krapfel, "New Product Development Cycle Time: The Influence of Project and Process Factors in Small Manufacturing Companies," *Journal of Business Research*, Vol. 36, Iss. 2, pp 179-187, Jun 1996.
- [9] J. K. Liker, D. K. Sobek II, A. C. Ward and J. J. Cristiano, "Involving suppliers in Product Development in the United States and Japan: Evidence for Set-Based Concurrent Engineering," *IEEE Transactions on Engineering Management*, Vol. 43, No. 2, May 1996.
- [10] B. McIlvaine. "Development of New Products is On the Fast Track," *Managing Automation*, pp 40-42, Nov 1996.

[11] M. H. Meyer and J. M. Utterback, "Product Development Cycle Time and Commercial Success," *IEEE Transactions on Engineering Management*, Vol. 42, No. 4, Nov 1995.

[12] H. Takeuchi and I. Nonaka, "The new new product development game," *Harvard Business Review*, pp 137-146, Jan-Feb 1986.

[13] B. J. Zirger and J. L. Hartley, "The Effect of Acceleration Techniques on Product Development Time," *IEEE Transaction on Engineering Management*, Vol. 43, No. 2, pp 143-151, May 1996.