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Abstract: Critique of the IEEE Transactions on Engineering Management article, "The Effect of Acceleration Techniques on Product Development Time."

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B. Desmond

EMP-9677

November 25, 1996

To: Professor Kocaoglu
From: Bert Desmond

Subject: Individual Research Paper

The Effect of Acceleration Techniques On Product Development Time

Introduction

This is my first paper analyzing an academic article. I would appreciate your help on improving the content and style of my report. I fear my report may be written in a harsher style than a traditional academic report.

This is an evaluation of the paper The Effect of Acceleration Techniques of Product Development Time, by B. J. Zirger and Janet L. Hartley, published in IEEE Transactions on Engineering Management, Vol 43, No. 2, May 1996.

Concepts

The key concepts the authors cover are a description and hypothesis test of various factors that are associated with reducing new product development time. The authors researched the relationship between 12 factors that are empirically associated with reducing development time. The 12 factors are:

1. Incremental Development
2. Part Reduction
3. Overlapping Design
4. Freezing Design
5. Supplier Reduction
6. Supplier Involvement
7. Cross Functional Teams
8. Dedicated Teams
9. Co-Located Teams
10. Empowered Teams
11. Time As A Goal
12. Management Support

Methodology

The first step was to develop a questionnaire to measure the independent variable (product development time) and the 12 independent variables. A 29 question survey document covered issues relative to the respondent's firm and the 12 independent variables. Respondents were asked to choose one recent product developed by their firm and answer all questions relative to that product's development and overall performance. If respondents did not have the knowledge to answer a specific question, they were encouraged to solicit information from other informants within the organization.

The second step was to send the questionnaire to 120 general managers in the electronics industry who were going to attend a two-week summer executive education program.

General managers were selected because the authors believed they had the right perspective to evaluate projects.

The last step was to analyze and interpret the results.

Contributions to the Literature

I believe this paper makes little or no contribution to the time-to-market literature because the authors make statements and draw conclusion that cannot be supported by their methods. There is a possibility that if the authors' recommendations were followed product development time would not be reduced.

Their conclusions and recommendations are invalid. The authors used methods of correlation or association to analyze the data, but they interpreted their results as if they measured causality.

Strengths and weaknesses of the paper in terms of concepts, methodology and results.

Concepts

The concept, understanding the factors that speed new product development, is a vitally important topic. Shortening time in all processes has been shown to be beneficial in reduce customer response time, reducing errors and lowering fixed and variable costs.

The Toyota Production System is thought to be a system to reduce production time. That is not the vision of Taiichi Ohno, father of Toyota's just-in-time system. In an interview with Norman Bodek, president of Productivity, Incorporated, Ohno was asked what Toyota is doing now. His answer was simple. "All we are doing is looking at the timeline from the moment the customer gives us an order to the point when we collect the cash. And we are reducing that time line by removing the non-value-added wastes." [1]

Methodology

The authors' methodology has serious flaws in sample population, non-response bias, and analysis technique.

Sample Population

The questionnaire was sent to 120 general managers in the electronics industry who were going to attend a two-week summer executive education program. Usable questionnaires were received from 44 people. The authors

assume that the general managers attending the seminar are knowledgeable about their new product development process for a specific product.

I am concerned about this assumption. If the authors tested this assumption by independently comparing responses from the general manager with people closer to the project such as the project manager or R&D managers they would a basis for validating this assumption.

Gupta and Wilemon use a combinations of field interviews and questionnaires of both managers and technologists involved in developing new products [2].

Non-Response Bias

Non-response bias is a well known problem. The authors received 44 useable questionnaires, thus 76 of the general managers inputs were not considered. Assuming the 76 non-responding general managers have the same beliefs as the 44 responding managers is a questionable assumption.

This is valid for all survey studies

Analysis Technique

The authors' methodology measured association or correlation. The technique showed how one variable may rise and fall with other variables. Somewhere in their thinking, the authors' made a leap from associations or relations between variables to causation or cause and effect. Their method is invalid for measuring causation.

The authors analysis does not take systems into account. The authors act as if each of the variables they are measuring has an independent effect on the independent variable. It is highly likely that accelerating new product development time depends on interrelationships between many variables.

Results

This is the weakest part of the paper. The authors over extend their methodology and offer prescriptive statements stating that some dependent variables will influence product development time. Here are four examples:

1) "Thus development teams with both greater cross functional representation and dedicated team members developed products faster."
2) "Can product development time be reduced by using the acceleration techniques cited?"
3) "Team structure and management variables appear to have the greatest impact on product development times."
4) "Focusing on incremental product development will not lead to faster development if time is not an explicit goal for the team.

The authors start their summary with: "...this research provides several valuable lessons for managers and researchers interested in time to market issues." Their are no lessons that can be learned from their analysis techniques.

Russell Ackoff, in his book, The Art of Problem Solving, says, "One cannot overestimate the frequency with which the erroneous inference of causality from association is made."

What are the conclusions of the paper? Are they well stated? How are they supported by the research reported in the paper? Do they need strengthening? If so, how?

The authors conclude that their research provides managers valuable lessons. They clearly and articulately describe their conclusions.

As noted above, their conclusions are not supported by their methodology and analysis as reported in the paper.

Their conclusions need improvement. Either, the authors could express their conclusions as relationships, and not as lessons. Or the authors could change their methodology using some form of experimental design so their methodology attempts to measure causation.

Are the references adequate, or have you identified other researchers in the same area that should be included? If so, give full citations and briefly describe their work.

The references are generally adequate.

I believe they could have used the Gupta and Wilemon paper more extensively [2]. They had one citation to this paper when describing the lack of senior management support as a reason for product delays. This was third in the list of reasons for product development delays following poor definition of product requirements and technological uncertainty. The authors did not include these two factors in their research.

The authors also did not include Quality Function Deployment as one of the factors to measure [3].

There is another, less well known, report that might be used. This is a McKinsey & Company report, "Using speed to drive cost and quality in development" [4].

Closing Comments

I am a novice reading and interpreting academic publications. My two experiences have raised concerns. My first experience was in a doctoral seminar at Washington State University with six doctoral students and a

professor who often spoke of the "scientific" research of management professors. He considered himself a scientist, and he gave the impression of being well versed in the scientific method. During a discussion a paper, a student asked if the author's analysis technique inferred correlation or causation. (The method was a clear example of regression). The other students were baffled and couldn't help the student. The professor seemed equally confused. My palms were sweating, but I kept quiet.

I thought the professor was using the Socratic teaching method so I spoke to him after class. I discovered, he couldn't answer the student's question. He did not have a fundamental grasp of the difference between correlation and causation.

I hope this is not a common occurrence.

References

[1] T. Ohno, *Toyota Production System Beyond Large-Scale Production.* Portland, OR: Productivity Press, 1988.

[2] A. K. Gupta and D. L. Wilemon, "Accelerating the Development of Technology-Based New Products," *California Management Review*, vol. 32, pp. 24-44, 1990.

[3] B. King, *Better Designs In Half the Time Implementing QFD in America.* Methuen, MA: GOAL/QPC, 1989.

[4] W. E. J. Hoover, "Using speed to drive cost and quality in development," : McKinsey & Company, 1990.

You're criticizing the study based on 4 ref's. (which is not enough)!