Title: A Critical Review of " Factors for Success in R&D Projects and New Product Innovation: A Contextual Framework"-1

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Abstract: A paper titled "Factors for Success in R&D Projects and New Product Innovation: A Contextual Framework" is critically reviewed in this individual report

A Critical Review of " Factors for Success in R&D Projects and New Product Innovation: A Contextual Framework"-1

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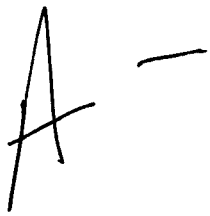
EMP-P9756

Literary Critique of the Article:

Factors for Success in R&D Projects and New Product Innovation: A Contextual Framework

EGMT 520/620
Fall 1998

Critique Written By: Stacey Ewton



Executive Summary

Many researchers have attempted to analyze the keys to project success. The goal of this paper is to critique one such attempt. Included in the following literary critique are details of the article's approach, contribution to, and comparison with, prominent literature, strengths/weaknesses, an analysis of conclusions, an analysis of references and a future studies portion.

Abstract

The paper, Factors for Success in R&D Projects and New Product Innovation: A Contextual Framework[1], analyzed prominent literature to determine if there are consistent viewpoints as to factors that contribute to the success or failure of R&D projects and new product developments (NPD).

Methodology

The following step by step approach was used as a basis for the paper's analysis and findings:

1. Review of R&D project management and NPD literature.
   a) Identify key success factors.
2. Review of literature of related fields as indicated by above factors.
   a) Determine consistency, if any, of key factors.
3. Review literature methodology to analyze consistency.
4. Make comparisons of methodology.
5. Test validity of conclusions.
6. Refine comparison to only 19 studies from related fields.
7. List key success factors from the studies.
8. Develop contextual model.
9. Propose set of propositions based on model.
10. Discuss implications of model for researchers and management of new products and R&D projects.

Contributions of Paper to Literature

The paper had three major contributions to literature:

1. The authors claim it was the first research which developed a hypothesis for the outcome of new projects based the multiple factors and their impact upon one another [1]. While other prominent literature has discussed a plethora of factors which contribute to a project's success or failure, past researchers have addressed the factors only on an individual basis and not their correlation with each other [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [15].

So What did they discuss?

[1] R. Balanchandra and John Friar, "Factors for Success in R&D Projects and New Product Innovation: A Contextual Framework," *IEEE Transactions on Engineering Management.* Vol.44, No.3, August 1997.

(Contributions of Paper to Literature Continued)

? How you confirmed this?

2. The article, as stated by the authors, was the first to discover that not only magnitude of contextual factor can vary, but also the direction. For example, the study noted that in one instance that increasing the level of marketing research might contribute to a project's success however, in another instance such as creating a very innovative product, too much marketing research might actually impede the development process and thus, contribute to failure.

3. Finally, the article is the only one of its kind that has grouped key variables for success into three contextual groups: innovation, technology and market. These contextual factors were then modeled into a "contingency cube" with hypothesized the importance of product evaluation factors on the contextual variables.

Comparison With Other Research Publications

The key differences between the article written by Balachandra and Friar and other research publications fall into the following categories:

⇒ Contextual attributes.
⇒ Definition of innovation.
⇒ Analysis and modeling.

Contextual attributes:

The key areas, noted by the paper, that contribute to success are described as contextual attributes. The authors identify qualitative factors such as, the nature of the innovation, nature of the market and the nature of the technology. This is in direct contrast to other researchers who focus on the quantitative measures of time, performance and cost [4], [9], [12]. A typical indicator of a successful project, as identified by other researchers, is if the product is introduced to the market on time, meets the performance expectations of the consumer and if the project was developed within budget and cost parameters.

As stated by the authors prominent, literature lists a multitude of variables which contribute to the success or failure of a project. While this statement is true there are definite congruencies in literature as to the key factors which lead to a project's outcome.

Ten key factors found by researchers to be crucial in the successful implementation of a project are [9], [6], [5], [11]:

1. Project mission: Clearly defined goals and general plan of attack from the onset.
2. Top management support: Willingness of top management to provide the necessary resources and authority for success.
3. Project schedule: A detailed specification of the individual action steps for project implementation.

(Comparison With Other Research Publications Continued)

4. Client consultation: Communication, consultation and active listening to all involved parties.
5. Personnel: Recruitment, selection and training to the necessary personnel for the project team.
6. Technical tasks: Availability of the required technology and expertise to accomplish the specific actions.
7. Client acceptance: The act of "selling" the final project to its ultimate intended users.
8. Monitoring and feedback: Timely provision of comprehensive information at each stated in the implementation process.
9. Communication: Good communication between all key players in the project implementation.
10. Trouble-shooting: The ability to handle unexpected crises and deviations from the plan.

Definition of innovation:

As do many researchers, Balachandra and Friar have their own interpretation of what product innovation is. They define innovation as either incremental or radically new. Balachandra and Friar further categorize incremental as "where the basic technology and product configuration remains essentially the same and only minor modifications are made to the performance, flexibility, appearance, and other characteristics." Most researchers would characterize this type of minor modification which enables a manufacturer to develop a new generation of products as imitation not, innovation [2], [14].

Analysis and modeling:

Finally, one of the major differences between this paper and other articles is the data used for the analysis and conceptual modeling. Most researchers use personal experience or detailed surveys to form the basis of their analysis and conclusions however, Balachandra and Friar based their research only on published literature. While this approach may have helped them remain unbiased it also limits their complete understanding of the projects described by other researchers and thus, might limit the accuracy of their results.

Strengths

The paper's strengths lay in four major areas:

⇒ Critique and comparison of published literature.
⇒ Analysis and refinement of methodology
⇒ Analysis of weaknesses.
⇒ Potential future studies.

(Strengths Continued)

Critique and comparison of published literature:

Balachandra and Friar analyzed over seventy articles. They were extremely thorough in their characterization of the similarities and differences amongst prominent literature. It would be interesting to find out if they initially planned to quantify the findings of other researchers in such detail or, if in the process of reviewing articles they found such an abundant amount of conflicting information that in-depth quantification was required to make sense of the data.

Analysis and refinement of methodology:

The authors were very vigilant in finding trends in published literature. They stated many times that there was a plethora of information with very little correlation. When Balachandra and Friar could not find trends they analyzed potential problems such as, the focus was too broad or the certain authors used just subjective data. They then narrowed their analysis to projects in two fields and authors who used only empirical data.

Unique modeling and hypothesis:

While there are some limitations of the author's model it was none the less unique. It was somewhat amazing to see such an innovative model develop from what appeared as a kludge of information at the onset. In addition, the ability to formulate a hypothesis which supported the analysis and model was impressive.

Analysis of weaknesses:

While many authors try to downplay the weaknesses of their research, Balachandra and Friar discussed in detail their limitations and potential for errors.

Potential future studies:

Hand in hand with their long list of weaknesses, Balachandra and Friar noted several future studies which could overcome them.

Weaknesses

Balachandra and Friar noted the following weaknesses in their analysis:

⇒ Timing of the studies.
⇒ Case selection.
⇒ Number of company respondents.
⇒ Industry specificity: Most of the articles focused on data that pertained to their industry only and thus, might not apply for other industries.

(Weaknesses Continued)

Timing of the studies: The data utilized was historical. Lack of real-time data could lead to bias.

Case selection: Most of the articles were based on successful projects versus projects that failed. Thus, little analysis was done on why projects fail.

Number of company respondents: The literature used for the study could have been subjective because most articles were written by only one person in the company.

Industry specificity: Most of the articles focused on data that pertained to their industry only and thus, might not apply for other industries.

In addition to the weaknesses noted by Balachandra and Friar the following weaknesses were also observed:

⇒ Topic too broad.
⇒ Small sample size.
⇒ Subjective nature of variables.
⇒ Analysis of three contextual groups.
⇒ Lack of conclusion.

Topic too broad:

One of the main conclusions noted by the authors was that few conclusions could be made from reviewing literature. The primary conclusion made was that the list of significant factors contributing to a project's success is "very long." The other conclusions were that different authors interpreted the magnitude of the factors in varying degrees as well as had different meanings for the same term. These conclusions do not seem revolutionary in fact they indicate faulty methodology. One thought is that the topic may be too broad. The authors should reevaluate their analysis after refining their search. One potential is to limit the topic to just R&D Projects or just New Product Innovation, but not both. Another suggestion might be to focus the analysis on just one industry prior to assuming the key factors for a successful project are the same across all industries.

Small sample size:

While the authors researched over seventy articles their final analysis was based on only nineteen. The sample size should be increased in order to provide more accurate results.

(Weaknesses Continued)

Subjective nature of variables:

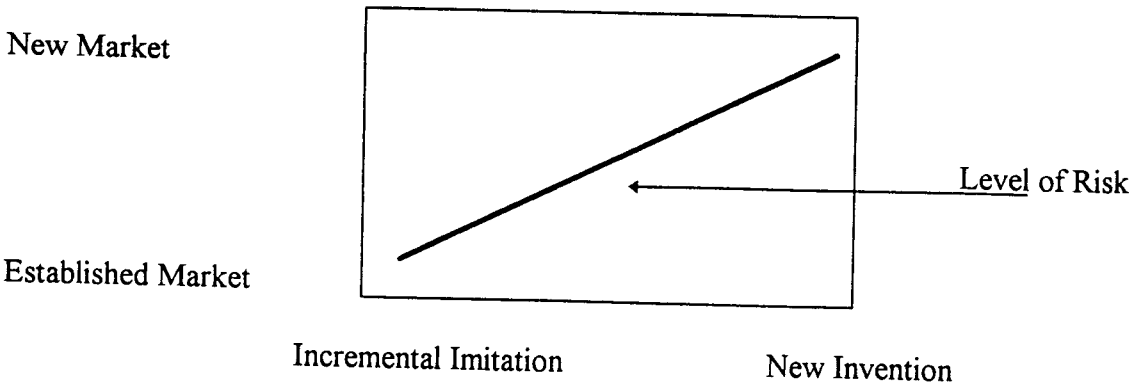
The authors focus on contextual factors and provide very few delineated definitions. Without a detailed description of what the factors reflect, interpretation becomes very subjective and may vary dramatically among individuals. A better way to analyze the data is to define the variables in a quantitative manner so that variation from interpretation is reduced.

Analysis of three contextual groups:

The analysis of the three contextual groups, technology, market and innovation, is shortsighted and covers only surface issues at best. For example, two types of innovation are listed, radically new and incremental improvements. The author's analysis only compares the success of development to understanding market potential and does not consider the organizational or managerial requirements that are required to successfully develop new innovative products.

In addition, the analysis of the market is limited to existing or, new. Balachandra and Friar state that a product with incremental improvements "meets an existing need with some improvements, and therefore the market uncertainty is low." This analysis does not address the fact that if a product in an existing market is at the end of its life-cycle minor improvements may not be perceived as adding value and thus, the market will reject paying a premium for the product. For example, creating a innovative wrist-rest for a manual typewriter will not extend the product's life when the market has migrated to computerized word processing. Additionally, a saturated market may require a new invention to spur on market growth.

In fact, contrary to the authors beliefs, the degree of market success should inversely correlate to the level of market uncertainty and level of innovation [6],[7]. This concept is depicted graphically below.



(Weaknesses Continued)

The final contextual variable as identified by the authors, Nature of the Technology, classifies technology as either high or low. While there are no definitions given of high versus low it is assumed that high tech depicts leading-edge designs. The statement of high-tech is "developing rapidly" was made with no reason given to why this is happening. It may be that more R&D funding is allocated to high-tech due to potentially large return on investments. If more money is spent on R&D more money may also be budgeted for marketing and hence an increased likelihood for project success. In addition, the authors state that early market entrants can be hurt because performance standards have not been previously set; while this statement could be true for certain instances, the converse could also be stated. . .early market entrants may set standards and thus, dominate market share by providing innovative, sole source, technology.

Lack of conclusion:

See Analysis of Conclusions listed below.

Analysis of Conclusions

The greatest weakness of the paper was its lack of conclusion. The reader painfully toils over pages of in depth analysis to find in the end that the authors have not identified any key factors that lead to a successful project outcome! This discovery is unnerving and irritating. Balachandra and Friar should have extended their research until they came up with a concrete conclusion.

Balachandra and Friar conclude that "success is a composite of a number of subjective and objective measures." They also state that the list of factors is long and interpretations vary dramatically. This conclusion indicates that they need to refine their research and review their methodology. As previously suggested they might want to narrow their analysis to just new product developments or just R&D projects. They may also want to start their analysis within just one industry and then test the hypothesis to see if the same factors apply across many fields. Additionally, they may want to go back to the original authors to define those terms they felt were subjective and varied from author to author.

Finally, the contingency cube approach is innovative, but does not visually illustrate the keys to success.; it must be used in conjunction with Table VI. Table VI puts the contingency cube in terms of relative importance of the market factors, technology factors and organizational factors. The big caveat on Table VI though it that is the authors state it is their "best guesses at this stage" which is far from scientific. In addition, the definitions and analysis they have provided for the contextual variables are shallow and ambiguous which makes their hypothesis suspect.

Analysis of References

Focusing on the negative, the references are old. The paper was released in August of 1997 yet the articles utilized in the analysis date back to 1962, with the majority eight to ten years old.

On the positive side, Balachandra and Friar did a lot of research and have over seventy references. The articles come from prominent, scientifically based, literature and therefore subjectivity should be reduced.

An interesting note is that none of the same articles were identified when a cursory search on project management was done by the author of this critique.

As stated earlier, the authors might try to narrow their search to industry specific articles or focus just on new product developments or, R&D projects.

Future Studies

Ideas for future studies fall into the following categories:

⇒ Independent survey.
⇒ Eliminate contextual disparity issues.
⇒ Testing the hypothesis.

Independent survey:

The authors need to test their hypothesis by holding a real-time independent survey. If their findings do not support the hypothesis they need to re-evaluate their methodology, analysis and finally, their hypothesis itself. Without an independent survey the authors must rely on past data generated by authors that could have been inaccurate or biased.

Eliminate contextual disparity issues:

The variation of definitions of contextual factors could be reduced by going back to the original authors of research articles for clarification. Additionally, it would be interesting to determine the discipline of the authors to determine the nature of their potential biases. For example, was the author who felt marketing contributed to success a marketer? Or, conversely, was the author who felt marketing negatively contributed in another discipline?

Testing the hypothesis:

The authors need to test their hypothesis and the importance of contextual variables through further empirical studies.

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