Title: A Critical Review of "The Failure of SDT Diffusion: A Case for Mass Customization"

Course: EMGT 520/620
Term: Fall
Year: 1998
Author(s): C. Mack.

Report No: P98056

Abstract: A paper titled "The Failure of SDT Diffusion: A Case for Mass Customization" is critically reviewed in this individual report.

A Critical Review of "The Failure of SDT Diffusion: A Case for Mass Customization"

Charles Mack

EMP-P98056

Table of Contents

Introduction

This paper will study "The Failure of SDT Diffusion: A Case for Mass Customization," by Glenn B. Dietrich, Diane B. Walz, and Judy Wyenkoop [1] (R2). The research paper under study identifies that Software Development Tools (SDT) such as Computer Aided Software Engineering (CASE) and Fourth Generation Languages (4GL's) and their relationship between producer and consumer. The scope of the consumer has been narrowed for this research, in that the user of common PC's has been eliminated and identified the consumer is the business unit that employs sophisticated SDT's. The focus of the paper delves into the fact that a developer cannot simply produce SDT's and send out enmasse to users. The complex nature of the CASE tools and 4GL's cannot be integrated into a business without adaption of the business or a customization from the producer of the SDT. The paper has shown cases of a business abandoning the use of an SDT due to its complex nature and complicated usage, which suggests that the enmasse release of the SDT's is failing. Studies viewed in the paper shows success when the producer of the SDT's and the consumer of the SDT work and mutually adapt the use to the specific application. They give proposals in the conclusion that suggest further research. The proposal for future research is based on two studies. More in depth study would entail further stratification of the consumer groups and SDT's.

Methodology Implemented

As a primary source of analysis in R2, the authors have conducted field observations by interviewing thirteen companies using SDT methodologies. These observations served as a field survey basis for the paper. They took the interviews from managers of various levels in the organizations to permit a ranging view of the SDT deployment. The selections of the companies to take part in the survey were limited to companies using Type 2 technologies (complex CASE tools). Data was not gathered to implement statistical analysis since this paper was to serve as a basis for future works. Information gathered was segregated into a Table that presented the findings in a form that showed the type of industry, SDT used, adaptations needed, amount of development environment adaptation and the success of applying the SDT technology.

Secondary sources were used in developing the basis for the research. Reference to the adoption of innovation in general was first broached by addressing the use of technology in a broad range of industries [9]. Secondary sources set up a model that predicts the outcome of planned technology-transition adaptation. [8]

Contributions to Current Literature

The paper under study has added specific documentation to the use of SDT's in industry and the difficulties related to implementation of SDT's in varied applications. Specific detail is given on the adaption levels of the business community to integrate SDT's into their systems. They show

that the integrations required a high level of knowledge for the business and at times requires new personnel to integrate the software. The onus of moving from an existing technology to a new technology rests on the business. The study conducted showed that on the job training and classroom investments of the business were required. This information added to current studies [9], [10].

This paper has brought a broad scope of investigation to the SDT arena that is current. They note that there has been no appreciable research in the adoption of CASE tools [4], " To our knowledge there is no piece of research that considers CASE usage when studying CASE impacts."

Comparison to Other Publications

In comparing the research paper under study to current literature, a common thread tied them together. PC Weeks' Christine Comaford [5] states that high expectations are placed on CASE tools and management is placed in a position to commit funds and energy to the adaption of CASE tools into the business scheme of operations. A mailed survey of many industries solicited the conclusions drawn by Christine. In yet another article in PC Week by Jamie Lewis, the focus of portability and the inability of businesses to apply an SDT "right out of the box" leads to the implication that they need customization to apply the SDT technology to the specific business requirements.

Studying the diffusion research by Iivari [4], one point not addressed by the paper under study are the participation levels of the consumers. Iivari broke down the participation in the adaptation into the organization by levels of organization (from management buy-in to users) and addressed the variables of educational levels and previous exposure to CASE tools. Iivari also polled a base of fifty-two organizations. His survey was directed to IS managers and had a wider range of questions of the CASE tool usage and implementation.

At odds with the premise of R2, stating the optimum adoption of CASE is with mass customization, the trend for present SDT's is off the shelf [11] versions with adaptation into the industry supplied by training and consulting. Also, 4GL's are replacing CASE [12]. 4GL's under development are simpler to use, but have the drawback of using more computing time. With computer speeds increasing rapidly, computing time has a decreased significance. This leaves the producer free from the mass customization proposition put forth in R2.

Strengths and Weaknesses

The paper under review takes considerable pains specifically to define the scope of the research. That is essential in understanding the focus of the work. CASE implementation and the company's using CASE tools are a vast area. They cleanly define all the variables to be discussed for the research. This gives the paper strength in defining a basis for the study taken and in the definitions of further research.

They did not identify variables that influence the adoption, such as previous exposure to CASE tools, in the criteria for field observations. They have shown that previous exposure to CASE tools directly reduces adaptation levels [10] to adopt the tools. Orlikowski's study [10] shows that the adoption of CASE by a firm with previous exposure to varied tools reduced the change to an incremental change. Industries not exposed to the tools previously experience a radical shift that causes organizational changes around the CASE tools.

Critique of Conclusion

The conclusions drawn in this paper are kept in the theoretical realm with no statistical data from in-depth study offered. The proposed framework for future works is hypothetical. Future work must include hard data with statistical analysis to show distributions of usage, monetary outlay, management involvement, employee training and past exposure to CASE tools to be validated.

In the rapidly evolving environment of SDT's, they did not define a strict definition of CASE tools and 4GL's. They address the small sampling of tools viewed in this paper. Yet, if this paper is to provide a framework for future work, they should address or cite the classifications of tools. If this work is to provide a framework for future research, they must more clearly define the framework, with variables clearly expressed.

Critique of References

Not all works cited in R2 were available for review at local facilities. I was able to study about half the works cited. I will not go into detail on each work, that would be yet another paper in itself. I did note that the basis of research was academic literature that had been published in professional journals. A basic statement of Diffusion Theory was drawn from the paper by J. Bayer and N. Melone [8] which was published in the Journal of Systems and Software, initiated from the Graduate School of Industrial Administration at Carnegie-Mellon University. The reasoning proposed in this paper was followed throughout the R2 article.

The information used by the authors of R2 had primarily been published in Professional Journals, which ensured the information had been screened for validity at least once. This lent credibility to the conclusions that they drew concerning the Diffusion of Case tools in industry.

One question glared at me as I was reading the reference literature, which was " Where is the link to CASE tools?" Many references to the diffusion of Information Technology in business referenced in business articles (e.g., Sloane Management Review, California Management Review) made no direct inference to CASE tools, simply Information Technology. This literature did give a basis for future work, but the link was not clearly and strongly correlated. The use of network systems can be seen as employing Information Technology and it is not directly tied to CASE tools. Generally the software described in the business articles were the "out of the box" variety that comes with a generic operating system. Beyond that question, I found the references quite precise and linked to CASE tools.

Future Work From This Paper

This paper opens topics in the application of CASE tools as applied to a specific industry and how various CASE tools would be best implemented to a specific industry. Studies conducted here were focused over a range of eight industries. It would be interesting to see how the application of a specific CASE tool could be best implemented to a specific industry and if the use of various CASE tools gives any advantage of productivity over competition. The application to a specific industry would gather a locus of similar management, educational levels, exposure to CASE and direct it to a specific output.

Implied in Iivari's work [4], was a compatibility degree that CASE tools have with potential adopters. Variables within the adopter's organization, such as: CASE experience, Education level, management support, user participation; could be seen across an industry wide area. This would make a very interesting area to study in depth.

Works Cited:

[1] G. B. Dietrich, D. B. Walz and J. L. Wyenkoop, " The Failure of SDT Diffusion: A Case for Mass Customization," *IEEE Transactions on Engineering Management,* Vol. 44, No. 4, November 1997.

[2] A.C. Boynton, "Corning Telecommunications Division Case Series, Darden Educational Material Services," Graduate School of Business, University of Virginia, Charlottesville, Va., 1991.

[3] H.J. Harnois, D. L. Peterson, and R. S. M. Lau, "Quality assurance comes to Gateway 2000: A preliminary study," *South Dakota Business Review.* , Vol. 53, No. 1, pp. 9-13, Sept. 1994.

[4] J. Iivari, " Why Are CASE Tools Not Used," *Communications of the ACM*, Vol. 39, No. 10, pp. 94-103.

[5] C. Comaford, " CASE has a place among developer cowboys," *PC Week*, Vol. 12, No. 21, pp. 18, May 29, 1995.

[6] J. Lewis, " Tool portability is key for future Net apps," *PC Week,* Vol. 14, No. 5, pp. 82, Feb. 3, 1997.

[7] R.G. Fichman, " Information Technology Diffusion: A review of empirical research," *Proceedings of 13th. International Conference of Information Systems*, Dallas, Texas, 1992, pp. 195-206.

[8] J. Bayer and N. Melone, " A critique of diffusion theory as a managerial framework for understanding adoption of software engineering innovations," *J. Syst. Softw.* , Vol. 9, pp. 161-166, 1989.

[9] A. V. Sioukas, "User involvement for effective customization: An empirical study on voice networks," *IEEE Trans. Eng. Manag.* , Vol. 42, pp. 39-49, Feb. 1995.

[10] M. J. Tyre and W. Orlkowski, " Exploiting opportunities for technological improvement in organizations," *Sloan Manage. Rev.*, Vol. 35, No 1, pp. 13-26, 1993.

[11] E. Carmel and S. Becker, " A process model for packaged software development," *IEEE Trans. Eng. Manag.* , Vol. 42, pp. 50-61, Feb. 1995.

[12] R. L. Scheier, "Off the Mark'," *Computer World*, Vol. 32, pp. 17-18, July 27, 1998.