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WRITING REFLECTIVE CASE STUDIES FOR THE *ENGINEERING MANAGEMENT JOURNAL (EMJ)*

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Abstract

This paper's intent is to help authors write reflective case studies for the Engineering Management Journal (*EMJ*). We offer a process to convert an applied research project with an organization to an EMJ manuscript. Writing a reflective case study is a process of abstracting experiences into approaches, processes, tools, challenges, and "lessons" for a broad audience of engineering managers. This paper serves as a guide for authors to write reflective case studies.

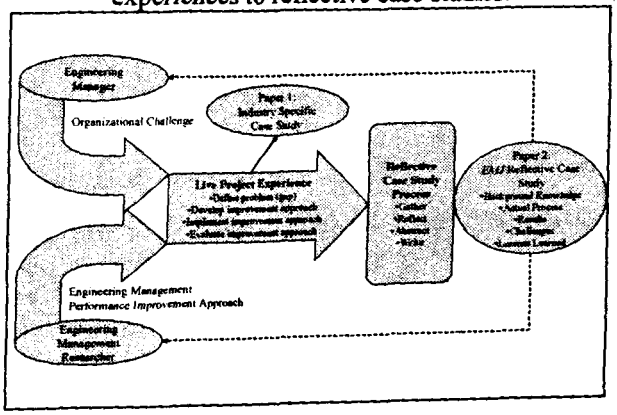
Introduction

A project experience offers a unique opportunity to align an engineering manager's organizational challenge with an engineering management researcher's/author's engineering management performance improvement approach (e.g., processes and tools). From this alignment of challenge and engineering management performance improvement approach a project is developed and implemented. The challenge for the engineering management researcher/author is to develop an academic, refereed paper from the project experience—that is, the author's challenge is to fit the project experience into the academic article style. The writer's challenge is in providing an engineering manager the knowledge that they need to address an organizational challenge (Kanter, Stein, & Jick, 1992; Kleiner & Roth, 1997; Kotter, 1996). This paper answers the question: How can I develop a research paper from a project experience? We provide a "reflective case study process" to fit the project experience to the *EMJ* article style. A project experience offers a unique perspective to learn from experience (Argyris & Schon, 1978; Follet, 1927; Hill, Nicholson, & Westbrook, 1999). The intent of this paper is to increase the number of useful reflective case studies for engineering managers by increasing the rigor of the case studies published.

Overview of Reflective Case Studies

As shown in Exhibit 1, we develop *EMJ* reflective case studies from project experiences. The reflective case study process intent is to develop research findings that are useful to any engineering manager facing a similar problem (i.e., paper 2 within Exhibit 1). The *EMJ* reflective case study provides learnings to help other engineering managers address similar problems and provide the engineering management researcher/author with insights for continued research into engineering management performance improvement approaches. The author can produce another article (i.e., paper 1 within Exhibit 1) that is unique to the technical or industry domain.

Exhibit 1. Converting project experiences to reflective case studies.



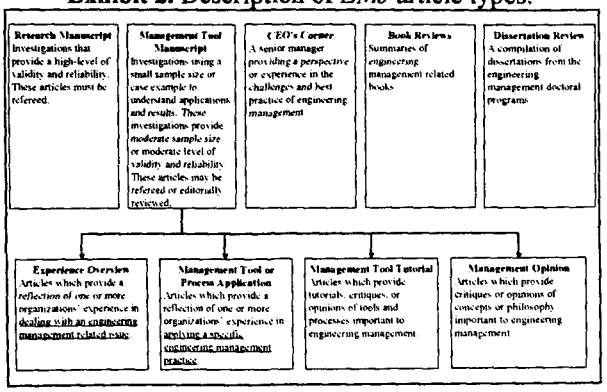
Why Are Reflective Case Studies Important? Reflective case studies help fulfill the *EMJ* mission. *EMJ* strives to provide value to the practice of engineering management and engineering managers. *EMJ* is an archival journal, which facilitates both practitioners and university faculty in publishing useful articles. *EMJ* focuses on articles that improve the practice of engineering management. *EMJ*'s goals are to:

1. Improve the practice of technology organizations and engineering management.
2. Improve the reflective practitioner skills of the practicing engineering manager.
3. Improve the research skills of faculty to produce useful and relevant knowledge for engineering management.
4. Improve student's understanding of the engineering management field.

EMJ publishes research manuscripts, engineering management tool manuscripts, CEO's corner pieces, book reviews, and a dissertation review. All research manuscripts are refereed, and other types are refereed

on request. All articles are subject to editorial review and revision. Submitted papers must not have been copyrighted, published, accepted for publication, or be in review for another publication. Copyright for published papers vests in the publisher. Exhibit 2 summarizes the five article types published in *EMJ*. The management tool manuscripts are further defined by four types. This paper aims to help authors write the "Experience Overview" and "Management Tool or Process Application" papers.

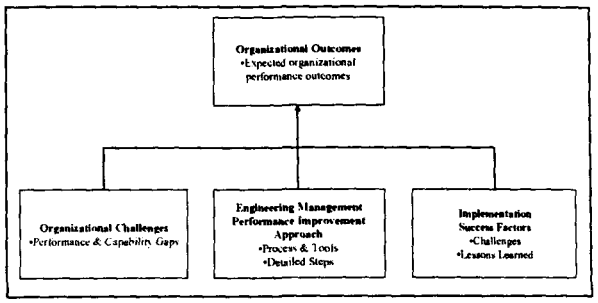
Exhibit 2. Description of *EMJ* article types.



What Are Reflective Case Studies? Reflective case studies are research articles that describe applying and learning about the why, what, and how of an engineering management performance improvement approach. An engineering management performance improvement approach is a process or tool used by an engineering manager to address a performance gap in the organization. Reflective case studies provide direction to an engineering manager on how to achieve organizational outcomes. As shown in Exhibit 3, we understand:

- The outcomes desired by the organization.
- The challenges faced by the organization.
- The engineering management performance improvement approaches that can be taken to overcome organizational challenges and to achieve organizational outcomes.
- How to successfully implement the performance improvement approach by understanding the detailed steps of the performance improvement approach along with implementation challenges and lessons learned.

Exhibit 3. Understanding engineering management performance improvement approaches.



To help the engineering manager understand how to use the performance improvement approach, the paper must answer key questions that the engineering manager is asking:

- **Why** is this article important to me?
  - What problem will this paper help me solve?
  - Why is the engineering management performance improvement approach being implemented?
  - What are the organizational or engineering management challenges being addressed?
  - What performance gap is being closed?
  - What question are you trying to help me answer?
  - Under what conditions is this performance improvement approach important?
- **What** do I have to do to address the challenges?
  - What knowledge do I need to have to understand and address the challenge?
  - What approaches, processes, and tools are available?
- **How** do I implement this performance improvement approach in my organization?
  - What are the detailed steps to implement the performance improvement approach?
  - What are the challenges in implementing the performance improvement approach?
  - What lessons learned did you glean for your experience?

Process to Write a Reflective Case Study

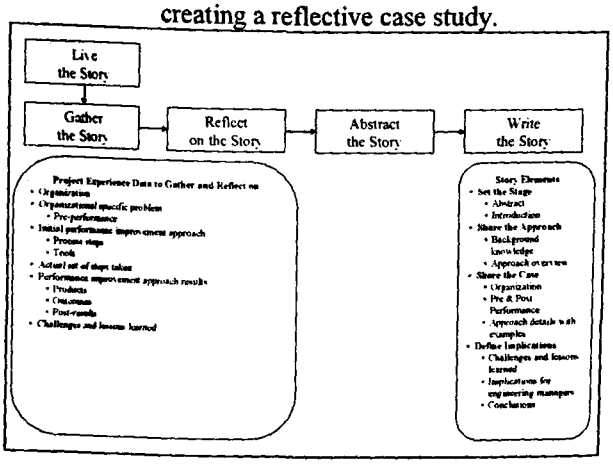
Writing a reflective case study focuses on developing a meaningful article. Writing a reflective case study is a process of adapting (*reflecting* and *abstracting*) elements from the project experience (*live* the story) to write an academic paper. As shown in Exhibit 4, the organization and author must perform the following functions:

1. *Live the story*—The organization actually implementing the performance improvement approach.
2. *Gather the story*—The gathering the data about the project experience. The engineering management author either gathers the data while performing the performance improvement approach or the author

gathers the data after the fact from the organization's experience.

3. *Reflect on the story*—The review of the actual process followed (versus the original planned approach and why the approach changed), the results, challenges, and lessons learned from living the story.
4. *Abstract the story*—The understanding of the underlying or common challenges facing the engineering manager and the generalized engineering management performance improvement approach that any organization can use.
5. *Write the story*—The development of the paper, which shares the reflections and abstracted story. Writing the story must produce an article that is credible to the academic and practicing engineering management audiences.

Exhibit 4. Process for creating a reflective case study.



Authors such as Cunningham (1993); Filippini (1997); French and Bell (1999); Glick, et al. (1993); Hedrick, Bickman, and Rog (1993); Lincoln and Guba (1985); and Yin (1989) provide processes and tools to gather, reflect, and abstract the story.

Writing the case study focuses on telling four components of an engineering management performance improvement approach story:

1. *Set the stage*—Defines the reason for the performance improvement approach.
2. *Share the approach*—Provides a brief overview of the performance improvement approach with background knowledge.
3. *Share the case*—Provides details of the "real-world" project experience.
4. *Define implications*—Provides further guidance to the help the engineering manager successfully implement the performance improvement approach in his or her organization.

The Appendix provides a summary and example structure for each element of the *EMJ* reflective case study.

What Are Some Examples of this Reflective Case Study Process? See the following EMJ papers for examples of this approach:

- Sousa, Van Aken, Groesbeck (2002)
- Van Aken, Van Goubergen, and Letens (2003)
- Nystrom and Poon-asawasombat (2003)
- Kotnour, Barton, Jennings, and Bridges (1998)
- Kotnour, Matkovich, and Ellis (1999).

Common Errors in Writing Reflective Case Studies

The primary error in writing reflective case studies is making the reader work too hard to find the important message: How can the reader use this paper to better manage? By making the reader work too hard, at least two problems can arise:

- The reader abandons the paper and learns nothing,
- The reader doesn't fully understand the paper and learns the wrong thing.

In either case, the aim to help the engineering manager be successful is not met (i.e., the paper's objective is not met). The ultimate loss is to the credibility of the profession, journal, and author. Specific examples that make the reader work too hard include:

1. Focusing the abstract and introduction of the case organization's unique problem.
   - In this instance, the reader then needs to determine if the paper is actually applicable to them.
   - The reader will react by not reading the article, and will abandon the article before they begin to read it.
   - To improve the paper, the author needs to make the abstract and introduction generalized so others can see how the paper applies to their organization.
2. Providing little or no background on the underlying concept or model.
   - In this instance, the reader then needs to pullout the steps on his/her own.
   - The reader will react by abandoning the paper or pulling out the wrong steps.
   - To improve the paper, the author needs to provide a general overview to the approach with a graphical model showing the performance improvement approach.
3. Not providing an overall picture of the steps in the process or elements of the tools.

- In this instance, the reader then needs to pullout the steps on his/her own.
- The reader will react by abandoning the paper or pulling out the wrong steps.
- To improve the paper, the author needs to provide a graphical model showing the performance improvement approach. This provides a visual map between the concept and the case application.

4. Not describing the organization's context.
   - In this instance, the reader then needs to determine the credibility and applicability of the model.
   - The reader will react by ignoring the findings.
   - To improve the paper, the author needs to provide a concise description of the organization and the context facing the organization that drove them to use the process or tool.

5. Not connecting the case examples to the overall process or model described earlier in the paper. Not providing specific examples related to the organization' use of the step.
   - In this instance, the reader then needs to determine how the case implemented the performance improvement approach.
   - The reader will react by abandoning the paper or not understanding the performance improvement approach in detail with examples that demonstrate the application.
   - To improve the paper, the author needs to use the same terms in the case description as was used in the performance improvement approach overview to describe the approach used by the organization.

6. Not providing post-implementation performance data.
   - In this instance, the reader then needs to determine if the application is credible.
   - The reader will react by not putting much faith in the application and view the article as an "academic" exercise without application to their problem.
   - To improve the paper, the author needs to provide the change in performance that was accomplished.

7. Not providing the challenges or lessons learned in using the approach.
   - In this instance, the reader then needs to determine how to best implement the approach.
   - The reader will react by trying to implement the method and running into roadblocks. The reader may loose faith in the performance improvement approach, the author, and the journal.
   - To improve the paper, the author needs to provide specific lessons learned to help the engineering manager implement the approach.

These common errors and suggestions are offered to help the author avoid these traps. The author can use these suggestions to produce a paper that is useful to the engineering manager.

Conclusion

Reflective case studies can be powerful tools for the engineering manager in solving organizational challenges. To be useful the reflective case study must answer the engineering manager's questions and be abstracted to such a level that the engineering manager can apply the performance improvement approach and associated lessons learned. A systemic process can be followed to product useful reflective case studies.

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About the Authors

Tim Kotnour received his Ph.D. and M.S. degrees from Virginia Tech. He is currently an Associate Professor at the University of Central Florida in Industrial Engineering and Management Systems Department. He is also the director of UCF's Management Systems Performance Laboratory. His research interests include engineering organizational performance improvement, organizational learning and strategic and project management, technology planning and learning communities. He has been actively engaged with the NASA Kennedy Space Center since 1996 in conducting research, education, and technical assistance in large-scale transformations. He is the Editor of the *Engineering Management Journal*.

Rafael Landaeta received his Ph.D. from the University of Central Florida. He is currently an Assistant Professor at the Old Dominion University in the Department of Engineering Management.

Appendix

Paper Element		Description of Paper Element	Example	Role in Telling the Story
1. Title		• Defines in one sentence the contribution and/or the overall engineering management area to which the paper contributes • Defines the industry in which the performance improvement approach took place	Challenges + Process: A case example from...	**Set Stage (Why & What)**
2. Abstract		• Provides a summary of the contribution the paper makes—the type of process and the number of steps, etc. • Defines the generalized challenges and questions being addressed • Defines the case used to demonstrate the EMI	• This paper contributes... • The process contains # steps: 1)..., 2)..., • The manager can use this paper to... • We develop challenges and lessons learned from a case study with...	
3. Introduction		• Discusses the generalized challenges facing the technical organization or engineering manager that the article deals with • References 1-3 articles that discuss the challenges • Defines the engineering management question addressed by the paper	• The technical organization faces challenges... • The engineering manager faces challenges... • This paper addresses the manager's question: .... • To answer this question, this paper discusses the following elements...	
4. Generalized Process Overview		• Describes the relevant background literature—provide 5-7 articles references that the reader can learn more from • Provides an overview of the performance improvement approach—name each step in the process, discuss each step with 1-2 paragraphs, and provide a graphical representation of the process	• Overview of background literature • General process overview o Aim o Step 1. 1-2 paragraphs explaining the step o Step 2. 1-2 paragraphs explaining the step o .... o Step n. 1-2 paragraphs explaining the step	**Share the Approach**
5 Case Description/ Application	**5.1 Organizational description**	• Describes the organization	• The organization used for the case study is... • The organization's business is...	**Share Case Study (How)**
	5.2 Pre-performance improvement approach performance	• Describes why the organization needed to make to the performance improvement approach • Describes the "why" • Describes the pre-performance improvement approach performance	• The organization decided to implement the performance improvement approach to... • The performance gap experienced by the organization included...	
	5.3 Actual performance improvement approach steps	• Describes the performance improvement approach taken • Provides examples of activities or outputs for each step of the general process • Provides the rich details and example	• Specific process description o Step 1. Detailed discussion and example of how completed the step o Step 2. Detailed discussion and example of how completed the step o .... o Step n. Detailed discussion and example of how completed the step	
	5.4 Post-performance improvement approach data	• Describes the post-performance improvement approach performance data	• The performance after the performance improvement approach changed by... • The results of the performance improvement approach include... • The outputs from the performance improvement approach include... • The outcomes achieved by the organization...	
	5.5 Challenges	• Identifies the challenges faced by the organization while confronting the experience • Describes each of the "5" challenges with examples	• In implementing this performance improvement approach we found # challenges o Challenge 1. 1-2 paragraph discussion with example of challenges o Challenge 2. 1-2 paragraph discussion with example of challenges o .... o Challenge n. 1-2 paragraph discussion with example of challenges	**Define Implications for Future Applications (How)**
	5.6 Lessons Learned	• Identifies the lessons learned while confronting the experience • Describes each of the "5" lessons learned with examples	• In implementing this performance improvement approach we found # lessons learned o LL 1. 1-2 paragraph discussion with example of LL o LL 2 1-2 paragraph discussion with example of LL o .... o LL n. 1-2 paragraph discussion with example of LL	
6. Implications for the Engineering Manager		• Discusses what the engineering manager can do with this paper • Discusses how the engineering manager can use this paper	• The engineering manager can use the results of this paper to... • When addressing organizational challenges, this process can be used to... • The steps/methods/tools that the engineering manager can use for implementing/using the results of this paper are...	
7. Conclusions		• Summarizes the article	• The technical organization faces the challenges of... • This paper provided... • The engineering management performance improvement approach provides... • From the case study application we identified a set of challenges and lessons learned...	