

A Business Multi-Case Study of Change Management in Software Implementation

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Abstract

Using a multi-case study approach, factors for successful change management during information technology implementation are suggested and evaluated. The study explores change management practices and outcomes related to the implementation of new software in a corporate environment. The outcome of the study suggests five factors as being crucial to a successful and efficient software implementation, i.e. that the software is useful to the end user and that the software is effective. The factors identified are: 1) Loci of the Change Agent (Internal versus External Development), 2) Data Validation, 3) Understanding the Needs of End Users, 4) Software Quality, and 5) Adequate Training and Support. These factors are evaluated using four case studies involving software change management.

Keywords: change management, software, implementation, factors

1. INTRODUCTION

The implementation of new software in the business environment is on-going and ubiquitous. In addition, there are many differences in the type, size, and complexity of information technology implementation projects, i.e. ERP, in-house software, architecture or infrastructure, etc. This research focuses on change

management during the implementation of business software (both large and small). The need for change management when software is associated with changes in business processes and put into production remains a challenging activity. Whether the software being implemented is an enterprise system or an upgrade to a new version of MS Office, the change must be managed and care must be taken to

ensure that the new software “takes hold” (is accepted), does what it is supposed to do (useful), and provides some value to the implementing organization (return on investment). Even the smallest changes in the way a system works can impact employee’s productivity, employee’s satisfaction, or customer satisfaction; if not managed properly.

This study was undertaken to evaluate several factors that could be used to improve the usefulness, satisfaction, acceptance, and return on investment for software implementations across a wide range of different software and across industries. The study contributes to body of knowledge by providing support for the identified theoretical factors impacting change management and suggests practical actions for practitioners to improve the success of software implementations.

Goals and Objectives

The overarching goal of this research projects was to develop a better understanding of the change management process related to software implementations. By studying and comparing implementations of software in multiple organizations we endeavored to find the common keys to success in these projects. Therefore, the research objectives were: 1) to identify factors that would improve the likelihood of software implementation success in organizations, and then 2) to analyze and determine which of these factors consistently had a positive and substantial impact on software implementation success.

Approach

To achieve the goal and objectives stated above, this research project used a multiple case study approach. The cases (companies and projects) were selected by first identifying companies that had recently gone through some type of information technology (IT) implementation, then the projects were examined to determine if they involved any aspects of change management. Once these projects were identified, a “key employee” from each company involved with the project was identified and contacted to act as the representative for that case. These employees then provided data about the projects via interviews and project documentation.

The first stage in the research project was a brainstorming session to identify a set of potential factors that impact software implementation change management. The second stage of the research examined four specific software implementation projects determine the extent to which each of the potential factors was present

(or absent). Third, the results of these individual cases were then examined for similarities and differences among and between the four cases. From this analysis, to achieve a better understanding of how the five factors impact change management and improve successful implementation of software.

Based on the results of this analysis, each factor was further examined by reviewing the extant professional and academic literature. Lastly, we summarize our findings for each factor, examine each one’s relevance to the individual case studies. This enabled us to identify items where each organization was doing well and pinpoint the areas where improvement might provide better results for future implementations.

The brainstorming activity was performed in one meeting of the company representatives. The activity used a modified group process such that each participant was asked to generate a list of potential factors, then these factors were listed on a flip chart. The participants then discussed the factors and used a consensus approach to narrow the list down to five factors. The factors determined to be most important were: 1) Loci of Change Agent (Internal versus External Development); 2) Data Validation; 3) Understanding the Needs of End Users; 4) Ease-of-Use and Usability; and 5) Training and Support. These factors were defined as follows.

Loci of Change Agent

Internal projects are often more complicated and employees have less leverage than a paying customer would. Core business processes need to be considered. Is in-house development a core business process? If not, then outsource (external).

Data Validation

Validation should be part of the development phase, not implementation. Important to use real data in a sample test environment. Creating a test environment for training is critical - best to duplicate production into a test environment.

Needs of End Users

Understanding the needs of end users prior to development and implementation is critical for the success of the change management initiative. Understand customer/end user needs/goals and comparing that to design implementation strategy to see if they are compatible and know where the gaps are. Important to understand that end user needs vary: What worked on one project may not work because user needs vary. For

example, some users want less flexibility/functionality, others want more.

System Quality

Ease of use and usability by end users can minimize non-value added work and employee frustration/dissatisfaction. Simplicity of interface is important - "Murphy proofing."

Training & Support

New systems have a learning curve associated with them and needs planned be around. Emphasize importance of sharing best practices after implementation. Continued support should not be overlooked.

2. CASE PROJECT DESCRIPTIONS

Four software implementation projects from different organizations were studied with regard to change management. An overview of each organization's project characteristics are given in the Tables below.

Alpha Company

The Alpha Corporation has a hierarchical organizational structure based on four divisions. This includes independent operating companies (OpCos) within each division. Each one of these OpCos has multiple business units (BU).

Project Type Reporting Add-on for ERP
Sector Manufacturing
Initial Schedule 6 months
Budget N/A
Success Criteria Standardized reports to meet auditor requirements
IS software Enterprise Integration Solution
End-Users Oracle users for various modules
No. of End-Users ~5,000
Project Management Methodology Agile
Change Management Yes
Project Result Standard reports usable; additional customized reports have passed auditor requirements

Table 1: Alpha Project Characteristics

Beta Company

Beta Co. designs and manufactures engines for commercial and military machines, integrated digital components, electric power, and mechanical systems. Beta's machines are used to: power commercial vehicles, power military crafts of all sorts; and serve as power generators. Beta frequently uses engineering computer-based automated tools, which are built in-house, to design and/or redesign engine components.

Project Type Engineering Design Tools Suite
Sector Manufacturing
Initial Schedule Ongoing
Budget Several Million US\$
Success Criteria Streamline engineering design process
IS software In-house Fortran Codes
End-Users Engineers
No. of End-Users ~4,350 (US based)
Project Management Methodology Majority is Waterfall, limited instances of Agile-like behavior
Change Management No formal follow-up; submit help tickets through help desk
Project Result Mixed results - one tool was determined to be wrong multiple years after it was released; other tools do acceptable job at matching test data but often require non-conventional manual manipulations to get desired result

Table 2: Beta Project Characteristics

Gamma Company

Gamma is a small company that produces natural consumer goods and personal care items. They were recently purchased by a large consumer products (LCP) conglomerate and have operated as an independent subdivision since. (This entire research project began by examining a software change at Gamma, where it was observed that a miss in the sales forecast of \$1 million, or 12.5% of total annual sales, occurred due to a flawed implementation protocol and complicated end user interface.)

Project Type Information system
Sector Manufacturing
Initial Schedule 12 months; actual completion time was 18 months
Budget N/A
Success Criteria Working sales forecast system
IS software Sales forecast, one part of larger SAP ERP architecture
End-Users Sales account managers
No. of End-Users 15
Project Management Methodology Waterfall
Change Management Yes, some processes followed, but not all
Project Result Mixed results - some input errors have caused faulty forecast numbers and rework, but most input is accurate

Table 3: Gamma Project Characteristics

Delta Company

Delta is the owner of DeltaCard, most widely known for their general purpose reloadable prepaid Visa debit card. The company had been in business for nine years when they went through a transformation which led to new private equity board members and an entirely new executive team. This new team was making a push to prepare the company for massive growth through both organic and external acquisition methods. This meant streamlining processes and systems and making improvements wherever possible.

Project Type Budget & Forecast Tool Implementation
Sector Financial Technology
Initial Schedule 6 months
Budget Realistic
Success Criteria On time, working system with no data issues
IS software Adaptive Insights & custom APIs

End-Users Mid & senior level managers
No. of End-Users 25
Project Management Methodology Waterfall with shorter sprints to almost mimic Agile
Change Management Yes
Project Result Software went live within 6 months with no data issues and high user adoption rates

Table 4: Delta Project Characteristics

3. WITHIN CASE ANALYSIS

In order to determine the impact of the factors, the four software implementation projects were evaluated with a specific focus on what went wrong and what went right. To help structure the analysis, each case project was evaluated using seven criteria. These criteria were determined by reviewing prior case study research. The criteria used were:

- 1) Nature of the Problem/Issue,
- 2) Technology Involved,
- 3) Challenges,
- 4) Solution,
- 5) Advantages,
- 6) Disadvantages, and
- 7) Lessons Learned.

Using these criteria as a guide, each potential factor from the brainstorming session was evaluated for each case. The results of this evaluation is summarized for each company below.

Alpha Company

Due to the complexity and size of the ERP transformation project at Alpha, the reporting tool team is separate from the Oracle engineering team. When the fixed asset team encounters issues during the month-end reporting process because reports error out, a root cause analysis performed afterwards determined an internal disconnect between the two teams (tool team and Oracle). Therefore, the Oracle engineering team is now required to report any programming modifications to any of the modules weekly. When this occurs, it requires additional modification to the report scripts so that the end of month reports run without error. This is an example of the factor "Needs of End Users" being addressed by a change in the change

management process. This approach helps to alleviate missed deadlines during month end reporting, which is always on a tight schedule in order to produce consolidated reports for investors.

Beta Company

The second factor "Data Validation" is one area of major improvement identified in this example. The Beta Co. system's data validation is done after the fact. In one instance, a tool had been determined to produce inaccurate results several years after it was initially rolled out, which invalidated several models and forced major rework. Also, there is a disconnect between the features tool developers produce and what the design engineers need. There is a tendency for the developers to deliver what they think would be useful, and not what engineers actually requested. Thus, the factor "Needs of End Users" is apparent. Because of how the tools are developed and how they are implemented, about 70% of designers' time is spent debugging, with the rest spent on design. Thus, the project was rated negatively for the factor "System Quality" as well. Finally, the project also demonstrated the importance of the "Training and Support" factor. There is limited documentation available with the tools, and what is available is often outdated. Training is delivered via MS PowerPoint and by use and is very ineffective.

Gamma Company

The Gamma Co. system was internally developed using an off-the-shelf ERP system. This approach demonstrated the importance of the change agent. As for "Data Validation," an internal test group was implemented during development; however, no test version was available during training. This was one area of improvement identified in this project. Also, the only the needs of top management were considered when developing the architecture and interface, not the needs of input end users. This had a great negative effect on the end result. Because of how the architecture was developed and whose needs were addressed, the interface was difficult to use, complicated, and was prone to errors. Thus, the project also demonstrated the importance of the "System Quality." Finally, the project also could have improved in the "Training and Support" factor. The initial training was good; however, no follow-up or continued support was provided. Additional remote training sessions and a forum for end users to share best practices and lessons learned would have greatly improved the outcome of this project.

Delta Company

The Delta Co. system was an externally developed SaaS (software as a service) with internal customization and model development, which constitutes a mixed approach for the location of the change agent. "Data Validation" was also significant in this project. All data was validated as it was uploaded in multiple cuts and side-by-side analysis of new reports and models continued for three months. This was a strength of the project and one reason why it succeeded where the other projects failed.

Also, most users were included in the software selection and demonstrations. This also was an area of strength. Because of how the architecture was developed and whose needs were addressed, the interface was easy to use, with custom APIs to integrate the data. Thus, the project demonstrated a positive impact from the factor "System Quality." Finally, multiple trainings were offered with real data in a test environment, making "Training and Support" another area of strength. Because this project emphasized a number of the factors identified earlier, it resulted in success. It provides an example of an "exemplar" case; i.e., how change management for implementation of new IT systems should look.

4. CROSS CASE ANALYSIS

Once each of the individual cases was examined for the impact of the factors, an analysis of the cases overall was performed to compare and contrast the factors across cases. This analysis is summarized below. In addition, each of these factors are further explicated and placed in context of prior academic research.

Loci of Change Agent

When a business decides to implement a new IT process, one of the early business decisions required is whether external resources will be needed or if they have capable human resource in-house. Internal resources need a combination of industry knowledge and required expertise (Phillips et. al., 2016) in order to successfully develop and implement software projects without external consultants. When necessary, internal personnel should be in charge of sourcing external consultants for technology expertise transfer in order to support a successful implementation. However, these decisions should be made at the start of the project, with external support identified and brought in at the right time, in order to maximize the value of this expenditure.

From our data, it appears that larger corporations with more managers have a greater talent pool to tap and may only source externally to access specialized knowledge or skill. However, smaller companies usually do not have the range of in-house expertise especially for intricate or complex projects. Complexity of the project, size, technology used, cost differentials, and personnel availability are the main drivers for this business decision. Also, this decision needs to be made early in a project in order to find and acquire the required IT skill set.

Data Validation

Many studies and countless implementations have been performed with varying methods that focus on everything from gaining senior management's buy-in to successful user training. At this point, the importance of senior management's support of a new implementation is widely accepted as a standard requirement (Schniederjans et. al., 2012). Also, as software becomes more advanced and experience is gained around implementations developers are held to a higher standard. It is no longer acceptable to go live with a system that has any major issues, especially data issues. Users expect attractive, easy to use software and are much more likely to resist a new system that has data issues at roll-out (Kakar, 2014).

Software and user interfaces have advanced to the point where users now expect an aesthetically pleasing graphic user interface that is intuitive and free of issues. As Kakar's (2014) research proved, users will no longer accept a system that has an MS-DOS like interface and more importantly, they will not pay for it. The expectations of users have moved passed functionality and into aesthetics which can be seen in any large software company now such as Concur, Salesforce and even many ERPs who have or are creating beautiful and easy to use applications. Users of new systems are naturally nervous and encountering data issues only exacerbates their skepticism. Even a minor data issue can greatly impact a user's trust in the system, and without trust, users will not adopt the system - which ultimately leads to a failed implementation (Schniederjans, 2012).

Arguments have been made to assign a Project Manager (PM) to systems implementation projects as standard practice (Ziemba et. al., 2015). In Ziemba and Obłąk's research, implementations that did have a PM experienced much more effective communication flows, which lead to fewer major issues and an overall 33%

faster time to roll-out (2015). Also, the projects with PMs were more focused on data validation and gained user trust much faster than projects with no PM. This stresses the requirement of data validation and the importance of validating before going live to avoid losing trust from users.

Needs of End Users

When considering the needs of end users for an IS initiative, it is important to look at the process as a whole to properly identify when it is appropriate to engage end users (i.e. customers or employees). The Lean Framework that is commonly implemented for Supply Chain systems, and still holds value for IT change management initiatives, is exceptionally useful for identifying end user needs. Arlbjørn et al. broke down the Lean Framework as shown in Appendix 5, where we will focus on the Principles section for this paper (2011).

This paper emphasizes the so called five principles of action, starting with specifying value from the customer's perspective (or to generalize for IT applications, the end user). This first principle is an overarching principle the companies studied in this paper seemed to miss. As in the GE Aviation example, the tool team does their own initiatives without having the end users involved, so the efforts are misguided from the start. The second principle forces the IS team to look at the process as a whole, so the optimal timing for the system roll-up is picked and business operations are compatible with the change initiative. Principles three and five are focused on continual support, optimization, and efficiency of the change management process during and after the design implementation phase. Finally, principle four is probably the most crucial in that it calls for only making what the customer is asking for. This is helpful as the IT team is really only producing what is value-added to the customer, which helps to eliminate any guesswork.

In addition to Lean principles, we researched change agents that have demonstrated success. To this end, Pascale and Sternin documented the Traditional and Positive Deviance approaches to change. Pascale and Sternin outlined the difference between the Traditional (i.e. top-down) and the Positive Deviance (i.e. bottom-up) approaches.

The Positive Deviance approach has been shown to be successful for some of the messiest and most difficult global problems, such as malnutrition in Mali and Vietnam, the spread of

HIV/AIDs in Myanmar, etc. (Pascale et. al., 2005). The overarching theme in Pascale and Sternin's work is no matter how messy or dysfunctional the organization and/or problem is, there exist change agents that can be leveraged by first identifying them.

In the example of Beta Co., despite an overall negative perspective of the tools team, there is an individual that works with engineers daily, documents all the end user needs, and spends most of his time adding functionality specifically requested by the engineering design team. In addition, this individual goes through multiple sprints and continually releases production versions of the tool that are only addressing the needs requested by end users. His approach is very much similar to the Agile project management approach, but at an individual contributor level. This has resulted in a tool that has good functionality and ultimately meets end user needs for its specific application. However, this tool depends on other tools owned by other individuals who do not use the Positive Deviance approach, resulting in an overall perception of having a clueless tools team. Beta Co. could resolve the outstanding tools issue by leveraging the successful change agent role on the tools team.

Kobus et. al. described when it is most appropriate to use the Traditional versus the Positive Deviance approach (2017). Where Kobus described the Traditional approach as only seeking to fix what is wrong, and being the most appropriate when employee/customer behavioral adjustments are not needed, or when a problem requires intensive mental effort (2017). In other words, when people are not adversely impacted by the change initiative, they will not care about the initiative and likely will not want to be involved. These circumstances make the Traditional approach the best for this type of situation; however, there are limited instances when this scenario will arise in the business world. This brings us to the Positive Deviance approach, where the community takes ownership during implementation (Kobus et. al., 2017). The Positive Deviance approach is appropriate when buy-in from people is required at a grassroots level, and behavioral plus attitudinal changes are required (Kobus et. al., 2017).

It is important to note both the Lean Framework and Positive Deviance approach focus on the customer or end user, and actively seek their input during the change initiative.

Software Quality

Software quality as measured by ease-of-use and usability has been thoroughly researched in the information systems discipline. The technology acceptance model (TAM) is probably the most well-known model in the discipline. The relationship between system quality and change management for system implementation would seem straightforward, i.e. software that is well designed should make the change management process easier.

Creating a system that is easy to use for the ultimate end users will minimize non-value added work, as well as employee frustration and dissatisfaction. One of Arlbjørn et. al. (2011) five principles of action includes "producing only what the customer pulls" (Kobus et. al., 2017). According to Kobus et. al. (2017) "this principle balances the terms waste and value because every service delivered that is not directly requested by the customer is considered to be waste - for example, software functionality that is never used."

Although Arlbjørn and Kobus use the term "customer," this can still be applied to the implementation of a new IS system. The customer in this case is the end user. In order to increase ease of use, the system interface should be simple to use. This involves making input entry simple, building the system so that inputs can only be entered one way. Some call this "Murphy-proofing." By simplifying input entry, you reduce the chance of error and re-work.

Training and Support

Many frameworks for successful management involve providing training and support. A framework created by Armenakis and his colleagues (1999) states "there are five key beliefs that change agents should seek to develop in employees," and one of these beliefs is "the employees will receive the support (e.g. training) they need to cope effectively with the demands for change" (Morin et. al., 2016). This approach must also be applied to successful implementation of a new IS system.

As authors Ewa Ziemia and Iwona Obłąk (2015) state, "a successful IS project requires, among other things, a human resource strategy to improve the necessary employee skills and their engagement in the process of (change management)." One way support can be provided at little to no cost is by enabling the end users to share best practices and lessons learned. Continued support should not be overlooked, and

the importance of sharing between end users should be emphasized. "Ongoing support will be necessary if organizations want employees to feel empowered to handle change as effectively as possible within their domain of influence" (Morin et. al., 2016). As with any change, new systems will have a learning curve. After the initial training, this learning curve needs to be planned around accommodated for. The learning curve varies between people and differs according to the system being learned.

5. IMPLICATIONS & RECOMMENDATIONS

Change Management best practices for successful implementations that are on-time, on-schedule, meet cost objectives, and perform to expectations are important for all companies, large or small. The roots of change management theory can be traced back to the 1940's, when Kurt Lewin identified the three critical steps to this process (see APP C). Although these steps have been modified over time, the imperative learnings are represented in all five factors identified in this paper. For example, both the Lean Framework and Positive Deviance approach focus on the customer/end user, and actively seek their input during the change initiative. This is consistent with the change section in Lewin's model to communicate often, empower action, and involve people in the process. Creating a system of training and continued support, as discussed in the Training and Support factor, also ties directly to Lewin's model, where he emphasizes the need to develop ways to sustain the change and provide support and training during Refreeze.

There are many models for change management, but this paper serves to highlight the most important factors based on a thorough literature review and four unique case studies. By following the ideas presented here, both executive and IT leadership can implement change to their existing architecture and systems with less problems and greater success. By learning from the mistakes and successes of past projects, future teams will be able to improve their own IT change management processes.

6. CONCLUSIONS

The research analysis presented in this paper started from a review of academic and practitioner literature, in order to identify key factors in software implementation. These factors are not all encompassing and a successful implementation could occur without all five

factors, but research makes it clear that to have the highest probability of success, all five factors are critical. The limitations of this study include sample size, project implementation scope and unintentional human bias. Although a set of real implementations were considered, our observations are limited to this small set and generalizations to a larger population cannot be made. One aspect that would impact the magnitude of each factor that was not considered is project scope. For example, one could have been a one month implementation with two developers while another was a three year implementation involving teams of developers, project management and input from many consultants. Lastly, unintentional human bias always has an impact on recollection of events, especially non-recent events. To limit this bias seven points were used to analyze the issues encountered and only relevant implementations within the last five years were taken into account. Future studies should use multi-measures to include team members involved within each software implementation and could investigate the impact of the level of involvement from each functional area of the team members. Also, gaining the viewpoint of multiple people involved within each implementation could lead to valuable insights around what each functional team considers a success.

7. REFERENCES

- Arlbjørn, Jan Stentoft, Per Vagn Freytag, and Henning De Haas. "Service Supply Chain Management." *International Journal of Physical Distribution & Logistics Management* 41.3 (2011): 277-95.
- Armenakis, A.A., and A.G. Bedeian. "Organizational Change: A Review of Theory and Research in the 1990s." *Journal of Management* 25.3 (1999): 293-315.
- Hawley, Jessica. "10 Best Practices and Advice for the Change Management Process." *The Fast Track*. QuickBase, 9 Mar. 2017. Web. 12 June 2017. <<http://www.quickbase.com/blog/10-best-practices-in-change-management>>.
- Kakar, Adarsh K. "When Form and Function Combine: Hedonizing Business Information Systems for Enhanced Ease of Use". 2014 47th Hawaii International Conference on Systems Science 47 (2014): 432-441.
- Kobus, Jörn, Markus Westner, and Susanne Strahinger. "Change Management Lessons Learned for Lean IT Implementations." *International Journal of Information Systems and Project Management* 5.1 (2017): 47-60.

- "KPIs in 'ITIL Change Management'." KPI Library. KPI Library, n.d. Web. 12 June 2017. <<http://kpilibrary.com/categories/change-management>>.
- Lewin, Kurt. Lewin's change management model. Understanding the three stages of change. Web, 12 June 2017. <https://www.mindtools.com/pages/article/newPPM_94.htm>.
- Morin, Alexandre JS, John P. Meyer, Émilie Bélanger, Jean-Sébastien Boudrias, Marylène Gagné, and Philip D. Parker. "Longitudinal Associations between Employees' Beliefs about the Quality of the Change Management Process, Affective Commitment to Change and Psychological Empowerment." *Human Relations* 69.3 (2016): 839-67.
- Pascale, R.T., and J. Sternin. "Your Company's Secret Change Agents." *Harvard Business Review* 83.5 (2005): 72-81.
- Phillips, Jack J., William D. Trotter, Patricia Pulliam Phillips. "Maximizing the Value of Consulting: A Guide for Internal and External Consultants." Wiley Publishing. June 2015.
- Sanker, Greg. "How to Measure a Basic ITIL Change Management Process." *ITSMTransition*. ITSMTransition, 24 July 2013. Web. 12 June 2017. <<http://itsmtransition.com/2013/07/how-to-measure-basic-til-change-management/>>.
- Schniederjans, Dara and Surya Yadav. "Successful ERP Implementation: an Integrative Model". *Business Process Management Journal* Volume 19 (2013): 364-398.
- Ziemba, Ewa and Iwona Obłąk. "Change Management in Information Systems Projects for Public Organizations in Poland." *Interdisciplinary Journal of Information, Knowledge, and Management* 10 (2015): 47-62.