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3-1-2010

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# APPLYING AGILE SOFTWARE DEVELOPMENT METHODOLOGIES TO BUSINESS PROCESS REDESIGN/MANAGEMENT (BPRM)

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**ABSTRACT**

Agile principles are known to improve and speed software development. In this paper we explore the relationship between stakeholders and business process redesign/management (BPRM), how stakeholder involvement affects BPRM, and present a short case study that illustrates how Agile principles and methodologies can be used to enhance the effectiveness of BRPM.

**Keywords**

User participation, stakeholder, stakeholder involvement, business process redesign, business process management

## INTRODUCTION

Information systems development (ISD) research typically dwells on how stakeholder and user involvement or participation affected ISD projects (Markus and Mao, 2004). Recently research has turned its attention to stakeholder and user involvement in broader ISD projects, which include but is not limited to software. This paper will review the relationship between stakeholders and business process redesign/management (BPRM) and how stakeholder involvement affects BPRM, and present a short case study that illustrates whether Agile principles and methodologies can be used to enhance the effectiveness of BRPM.

The paper first defines terms that will be used and the effect of stakeholder involvement on system success is discussed. A case study illustrating how Agile principles and methodologies can be used in BRPM is presented, followed by conclusions and direction for future research.

## DEFINITIONS

To begin the discussion, it is imperative to define the terms to reduce confusion among the various researchers' works. The terms defined herein have at times differing definitions in the literature, and at other times interchangeable or complementary definitions. In the context of this paper, the terms will be defined as follows.

### Information System, Work System, System

Information systems can be comprised of any of the following: software, hardware, web-based front end, data warehouse, centralized or distributed hardware and software system installations, etc. While we do not discount the necessity to research each type of system individually, for this paper we will adhere to the broader adapted definition derived from Alter's (2001) research. Alter defines a "work system" as "a system in which human participants and/or machines perform a business process using information, technology, and other resources to produce products and/or services for internal or external customers." He argues that information systems are actually work systems "since they consist of human participants and/or machines performing a business process using information, technology, and other resources to produce products and/or services for internal or external customers." In this paper the term "system" will refer to Alter's definition for "work system," and will encompass the definitions for "information system," "work system," and "system."

### Stakeholder and User

Stakeholder and user involvement begins in the requirements phase of ISD projects. Beecham, et al (2005) showed that in the literature the term "stakeholder" includes all practitioners, customers and users; all people affected by the system with direct or indirect influence on the system requirements" (Sommerville & Sawyer, 1997). Thus, stakeholders can be users, and users can be stakeholders. Markus & Mao (2004) reviewed the literature and found that stakeholders "are those who are likely to be affected by a solution, whose acceptance and use of that solution could be problematic, and who are therefore logical candidates for participating in solution development or implementation. Participants are the subsets of stakeholders who are actually given the chance to participate in solution development and/or implementation activities." Users can be participants,

and participants can be users. For our purposes, we will apply the term "stakeholder" to mean stakeholder, participant, customer, and user.

### Involvement

The terms "user involvement," "user participation," and "user engagement" seem to be used interchangeably in the literature. Bachore & Zhou (2009) quoted Barki & Hartwick (1991) to define user participation as "referring to the various design related behaviors and activities that the target users or their representatives perform during the system development process" and user involvement when referring to a "subjective psychological state of the individual". An additional term coined by Kappelman and McLean (1991) is "user engagement," which "includes both participation (the behavior) and involvement (the attitude) and refers to the total set of user relationships towards IS and its development." Cavaye (1995) describes user participation as a "set of operations and activities performed by users during system development." Several researchers have studied user participation and collaboration (for example, Mattia & Weistroffer, 2008; Alter, 2009; Mattia & Weistroffer, 2009). This paper will use the term "involvement" when referring to stakeholder involvement, participation, or engagement.

## BUSINESS PROCESS REDESIGN/MANAGEMENT (BPRM)

Included in Alter's (2001) definition of a work system are business processes. Business processes can include (but are not limited to): new product or service development processes, marketing and customer-facing processes, internal work processes, information access and analytical processes, inter-organizational processes, etc. (Mohsen, 2004).

### The Effect of Stakeholder Involvement on System Success

Recent literature reviews show empirically how stakeholder involvement/participation is important to system success. In their review, Harris & Weistroffer (2009) found that while a standard measurement for user involvement has yet to be established, "user involvement has the greatest impact on system success if the user is allowed to voice an opinion and make choices from predefined options." Additionally, they found that there is an optimal level of user involvement, but "involvement beyond certain levels may be counterproductive." Bachore & Zhou (2009) found in 46 empirical studies that not only does the open source software development model (Tsang, 1999) include substantial user participation, but that user participation has a positive impact on system success.

There have been several case studies that concern IS projects being used to bring about BRPM. However, an IS project alone is not sufficient. For example, Markus (1983) illustrated an effort by one company to use a financial IS to accomplish organizational change, only to be thwarted by politics. Cooper (2000) found that "even if political, cultural, and other social issues are overcome, successful IT-enabled reengineering can only result with the existence of creativity."

A possible solution for successful BPRM is to use agile methods in BPRM.

Luna-Reyes, et al (2005) proposed a feedback-rich framework which appears to be similar to Agile methodology – the stakeholders give feedback concerning organizational change. In light of this and the aforementioned case studies, it behooves us as researchers to explore how best to apply agile methods to BPRM projects.

David Norton (2008) determined that BPRM needs to be a mix of discipline and agility, not the waterfall methodology that seems to be used by teams when they are presented with a BPRM project. He likens BPRM release cycles (i.e. a continuous cycle of design and optimization, iterations of fewer than six weeks, new policies and rules in a day) to Agile methodologies. Agile principles stipulate, among other things, an iterative approach to building software one small increment at a time, integrate stakeholder feedback at all stages, and recommend the assessment of the work done in each cycle in order to improve the process and better meet customer expectations. Reza Shafii (2008) asserts that there are two compelling reasons that an agile methodology would be well suited for the iterations of a BRPM cycle: 1) Each business process is modeled, and 2) as BRPM is by nature continuous improvement. He relates that

> by modeling a process, business analysts are, in fact, also creating a software execution model, just like developers are doing when designing and writing code. It is therefore reasonable to deduce that the same lessons learned from the failures of the waterfall model for software development, namely the difficulty of coming up with an accurate and complete set of requirements and design from the get-go and its associated problems, should also apply to process modeling. By the same token, it can be reasoned that the use of an agile methodology for BPM would help alleviate these problems. Second, given the assertion that BPM is an implementation of continuous improvement—as established in the first section of this article—it would be natural for it to call for a methodology that also embraces this philosophy, and, as we have seen, agile methodologies fit this requirement.

Shafii further illustrated that there is no existing BPRM standard in use today and recommends that BPRM analysts evaluate their current methodology against the principles of the agile manifesto to determine if perhaps it could be improved by using the principles therein, such as:

- Is the methodology iterative and incremental?
- Are the iteration lengths relatively short?
- Does the methodology allow for significant changes to requirements throughout the iteration?
- Does the methodology embrace communication and feedback between business analysts and the business users

Agile software development methodologies are a well-researched area and are beyond the scope of this article; Dybå and Dingsøyr (2008) cite numerous studies on agile methodologies. We will touch but lightly on agile software methodologies.

In Agile software development methodologies, stakeholders and users are involved in the ISD project from the very start. The principles in the Agile Manifesto includes "Business people and developers must work together daily throughout the project" (Agile Manifesto).

Qumer and Henderson-Sellers (2008) define an agile software development method as one that focuses on people:

> A software development method is said to be an agile software development method when a method is people focused, communications-oriented, flexible (ready to adapt to expected or unexpected change at any time), speedy (encourages rapid and iterative development of the product in small releases), lean (focuses on shortening timeframe and cost and on improved quality), responsive (reacts appropriately to expected and unexpected changes), and learning (focuses on improvement during and after product development).

For example, Extreme Programming (XP), an agile development methodology, has a set of values which includes feedback. The circular feedback from the customer to the developer and back again considers that "every contributor to the project is a member of the “Whole Team,” a single business/development/testing team that handles all aspects of the development. Central to the team is the “Customer,” one or more business representatives who sit with the team and work with them daily," and the customer is "a single person who can represent the requirements, acceptance criteria, and business value for the project," but is actually "a team of people that communicates with one voice with the Programming Team" (Lindstrom & Jeffries, 2004).

Our case study will examine whether agile development principles and methods can be used to redesign the business processes quickly, effectively, and accurately aligned with the stakeholder requirements.

## CASE STUDY

A pharmaceutical company was closing domestic and international research facilities. To comply with FDA regulations and legal requirements, an IT transition was necessary in which IT assets (hardware, software, and most importantly, data) were to be retired, consolidated, migrated, or archived. The FDA requires that all data (paper and digital) regarding drugs or drug compounds be archived in perpetuity. In addition, legal requirements for intellectual property and foreign nations' requirements must also be met. Unfortunately, the company was foundering with flawed processes which were onerous and unfit for the IT transition task at hand. This case study reviews the redesign of business processes at a research facility in Japan which was being closed.

Due to the closure of the research facility, the overall IT transition project was outsourced to a consulting firm to eliminate possible damage by disgruntled employees. The author was one of two team managers of a 40-person project team made up of project managers, business analysts, technical subject matter experts, technical writers, and other administrative personnel. This project team worked closely with counterparts in the US and European offices, which were receiving archival data, hardware, and software. Though there were over 90 separate projects to migrate, archive, consolidate, or retire hardware, software, digital and paper data, and other drug-related assets, to comply with length restrictions this case study will only focus on a few projects.

Based on previous software development experiences and familiarity with agile methodologies, the team managers decided to test whether agile development methods could be used to redesign the business processes quickly, effectively, and accurately aligned with the stakeholder requirements. A review of system yielded several business processes which could be improved. One such process was the data archival process, which included 17 major steps and took nearly 1 month to complete (see Figure 1). By contract, the archival process of paper-based lab notebooks had a total of 4 major steps and took less than 2 weeks.

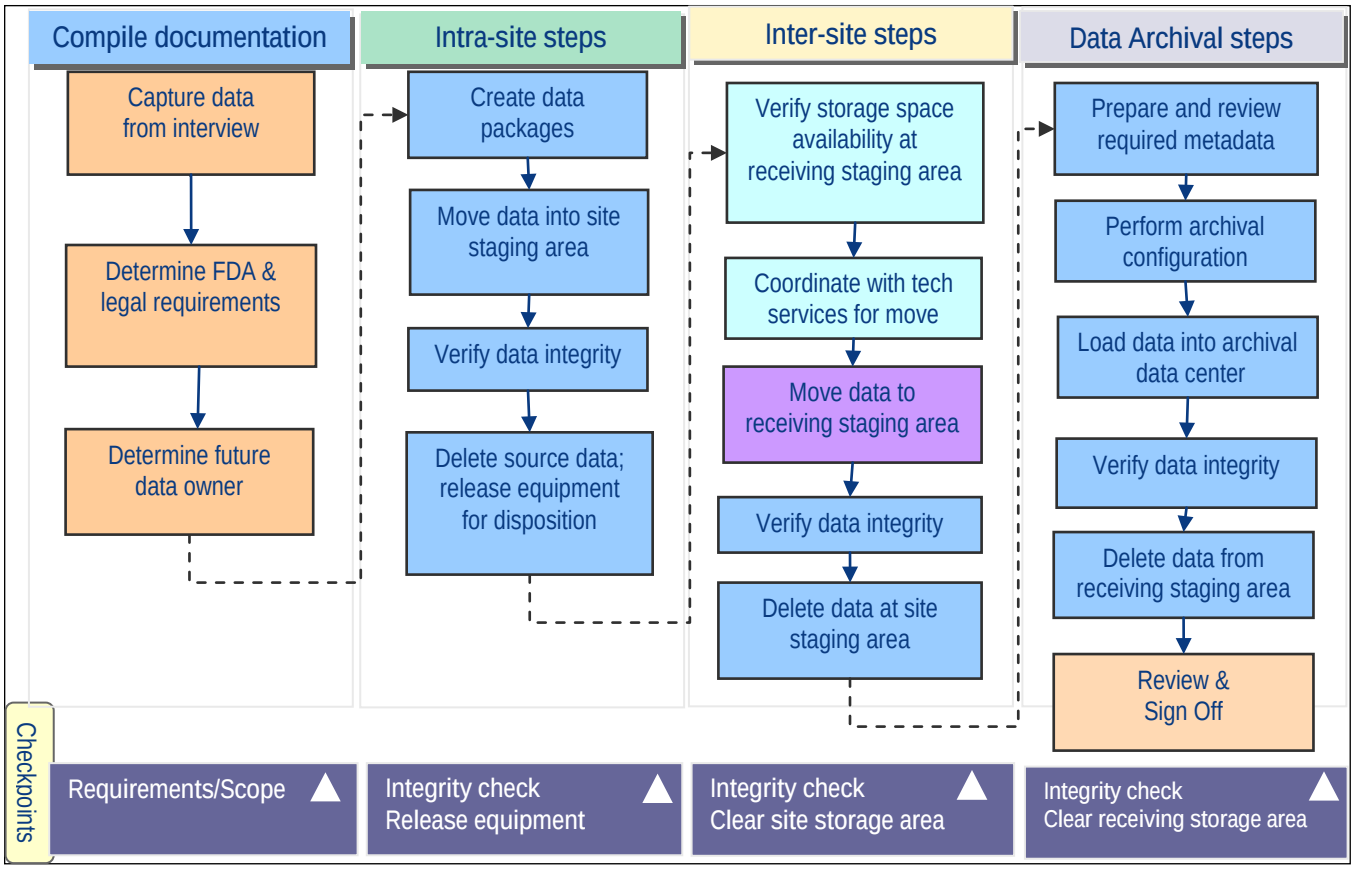


**Figure 1: Data Archival Process Before BRPM**

**(each step contains one or more sub-steps)**

Following agile principles, the BPRM iterations went roughly as follows:

1. process review and analysis
2. process modeling or re-modeling
3. process implementation
4. process monitoring and evaluation

Starting with a model of the system's current business processes, the team brainstormed about how to better achieve the IT transition goals. The processes were re-modeled, and the team then implemented the new model. The team met with stakeholders and customers on a regular basis to review their process change efforts and determine the stakeholder and customer approval.

At step one of the BRPM iteration, the team and stakeholders reviewed and modeled the current business processes and analyzed them for weaknesses and areas of improvement (Figure 1). Stakeholder involvement yielded invaluable input at this step, particularly in the areas of corporate policy, and legal and FDA requirements. At step two, the weaknesses and areas where improvement was needed were re-modeled, again with stakeholder/customer input. Site-specific needs were discovered, redundant steps were analyzed and some subsequently deleted, etc. During each iteration the resulting model was put into place during step three, which required little stakeholder involvement, except where direct participation was necessary. The process monitoring in step four began upon process implementation, and the process evaluation occurred within two to three days, depending upon the scope and effectiveness of the change.

During the iterations, several challenges had to be dealt with; for example, opposite time zones, language, signature requirements, corporate data security policies, etc. Many meetings occurred during the working hours for the overseas counterparts – evenings in Japan. This necessitated extra meetings the following day with local stakeholders. Video conferences or conference calls obviated some meetings, but dealing with differing time zones offset the anticipated speed of iterative redesign efforts. Company policy of electronic signatures on project documents also presented a challenge as that

technology had yet to be implemented in Japan. Japanese file names caused major problems as the archival vendor had not expected double-byte file names (this was subsequently resolved by compressing several Japanese files as one file with an English file name). At the end of several weeks, the data archival process was reduced to 12 major steps and required only 5 days to perform (see Figure 2).

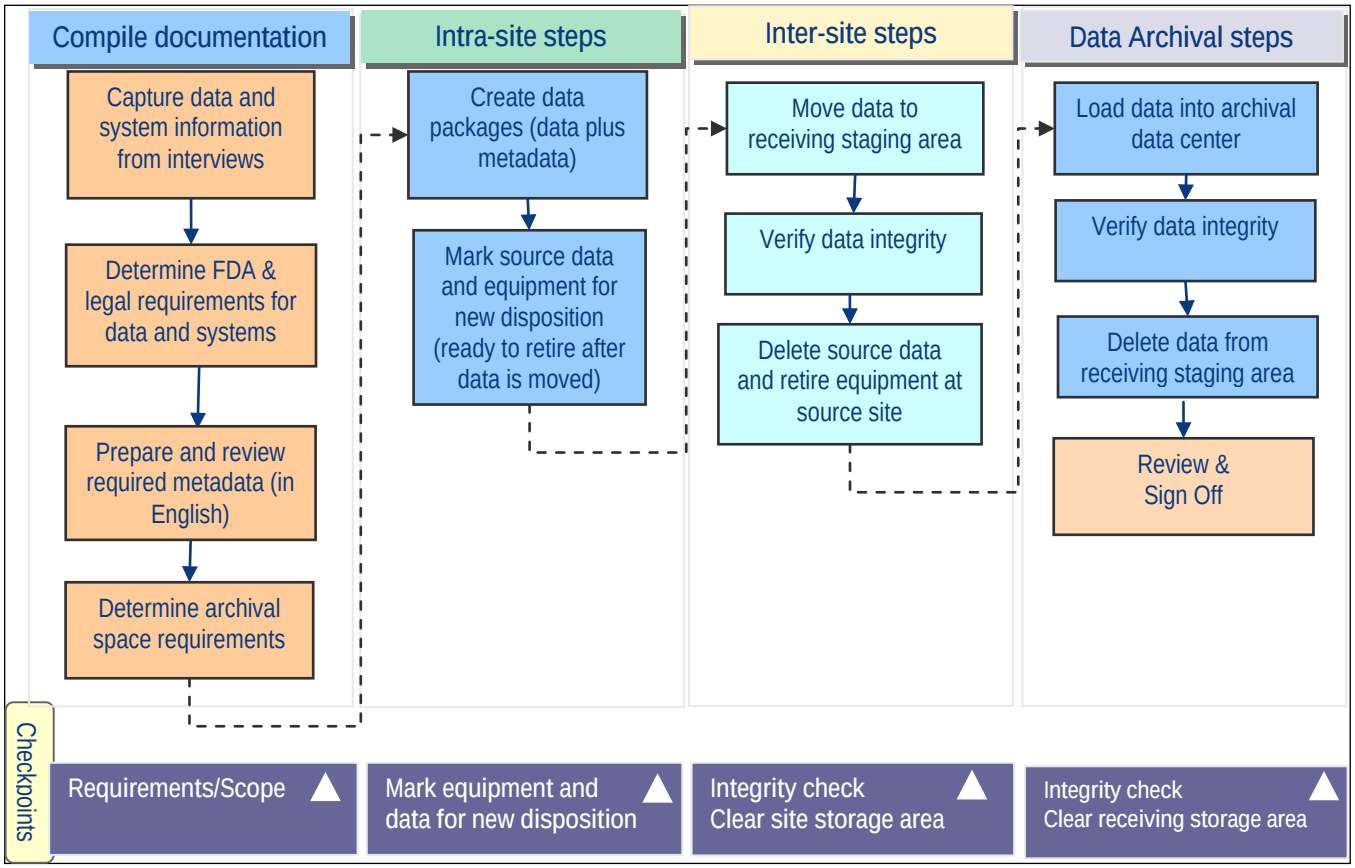


**Figure 2: Data Archival Process After BRPM**

**(each step contains one or more sub-steps)**

Within 3 months, the BPRM cycle had undergone several iterations. The given example is illustrative of most of the redesigned business processes that were clearly more effective and efficient, requiring less time and effort while accomplishing the goals of the IT transition and meeting the legal and FDA requirements.

## CONCLUSION

Though our experience is currently limited to one case study, we have seen that Agile software development principles and methodologies can serve as an effective methodology for BPRM. The constant stakeholder involvement in redesigning processes allow BPRM analysts to ensure the redesigned processes are aligned with stakeholder needs and requirements.

Though at times meeting with stakeholders may be difficult due to geography, language, or other barriers, making the effort to work with stakeholders at each step of the redesign yields invaluable results during a BRPM cycle. While the speed of testing in Agile development was not realized during BPRM, the BPRM cycle time was improved.

Future research plans include testing whether other Agile development principles and methodologies, such as pair programming, can be adapted to BPRM.

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