ONE SMALL STEP FOR PROCESS IMPROVEMENT, ONE GIANT LEAP FOR HEALTHCARE

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ABSTRACT

The focus of this paper is to present students’ perceptions of the recently developed A3 method for problem solving in the healthcare environment. The students were all employees of a large healthcare provider and were enrolled in a customized healthcare EMBA Program. Each student in the class was required to complete an individual A3 Project in order to improve a process at the department for which they worked for. At the end of the semester the students presented their A3 Projects to their peers and the best projects were voted on. A survey measuring perceptions of the A3 Method for problem solving in healthcare was administered and from it we present propositions for A3 implementation.

Key Words: A3 Method, Healthcare, Process Improvement, Lean Systems, Six Sigma

INTRODUCTION

Healthcare organizations are under increasing pressure to find ways to manage their operations and processes more efficiently and effectively. The healthcare environment is dramatically changing and these organizations must find ways to become more innovative, to lower costs, and to increase patient satisfaction. These are daunting challenges that can be addressed by focusing on process change under the overarching umbrella of strategic planning aimed at achieving performance excellence. This paper focuses on pedagogy developed to address how healthcare organizations can achieve process improvement by using A3 techniques to eliminate waste in healthcare [21].

During the summer of 2008, students in a customized healthcare executive MBA (EMBA) cohort class from the Lifespan Organization in Providence, Rhode Island, enrolled in two concurrent courses: Value Formation through Operations, and Continuous Improvement and Performance Excellence. The EMBA Program was a blended program consisting of ten distance learning classes of 90 minutes each and three face-to-face sessions that were held from 9:00 am to 5:00 pm, with breaks and an hour for lunch. An integrated approach to total quality management was developed, and supported by the use of quality tools, lean concepts and A3 problem solving for healthcare techniques. For the Value Formations class the students were required to complete an individual A3 Project to improve operational processes they were directly involved in.
THE A3 METHOD

The A3 Method was developed by Durward Sobek, Ph.D. and Cindy Jimmerson, R.N. [42] through a grant sponsored by the National Science Foundation. The A3 Method has its roots in the Toyota Production System and adapts two problem solving tools used by Toyota: Value-Stream Mapping and the Problem-Solving A3 Report. Value-Stream Mapping is a tool that identifies where value is added and not added in a process. Value-Stream Maps represent the flow of people, materials and information in the process and includes management decisions and supporting information systems that support the process. They can be used for manufacturing or service organizations as well as the supply chain [37].

The Problem-Solving A3 Report utilizes one side of an A3 sheet of paper (11 inches by 17 inches) in landscape orientation. The left-hand side (LHS) is used to show the current process while the right-hand side (RHS) shows the improved process [21,42]. The LHS is comprised of the following steps:

1. **Issue:** select a process to observe that has variability in its outcomes, where patient satisfaction could be improved or costs can be reduced. Ask the question “What is the issue through the eyes of the customer/patient?”

2. **Background:** develop a clear understanding of how the process interacts within the department and the history of the process. Ask when/where/how often does the problem occur? and objectively collect data so you can measure the Issue.

3. **Current Condition:** create a simple sketch of the current condition by using a set of standard or customized drawing symbols. In the sketch use storm clouds to highlight problems and within the storm cloud state the specific problem. The Current Condition should always be observed directly and an observation worksheet can be used to record the different activities in the process. Validate the Current Condition by getting staff input on the accuracy of the sketch.

4. **Problem Analysis:** list the problems identified in the Current Condition (the storm clouds) and for each problem ask Why? five times to determine the root cause of the problem.

Once the current state of the process is understood and a root cause is identified the RHS of the A3 Problem Solving Report is used to show the improved process. The RHS is comprised of the following steps:

5. **Target Condition:** draw a simple diagram showing a better way to do the work and highlight the improvements with fluffy clouds. Keep the improvement low cost and if possible create measurable targets for each improvement.

6. **Countermeasures:** identify the changes that must be made to the Current Condition in order to achieve the Target Condition. Countermeasures eliminate or convert storm clouds to fluffy clouds.

7. **Implementation Plan:** for each of the countermeasures identify what needs to be done, who will be responsible for getting it done, when it should be completed and what the expected outcome should be.

8. **Cost/Benefit:** a cost/benefit analysis of the Implementation Plan is necessary in order to justify the process change. Cost is the expense incurred to implement the plan and benefits include both the dollar savings and the improvement in quality.
9. Test: details on how you might test your Implementation Plan prior to full implementation. The Test should determine the effectiveness of the Implementation Plan and it provides an opportunity to make adjustments prior to full implementation.

10. Follow-Up: is conducted in order to determine if your Implementation Plan been accepted and is now the new way to do the work. The Follow-Up should include the person responsible, the measure or test to be used, and when the Follow-Up will be conducted.

The objective of the A3 Method is to create the IDEAL healthcare environment. Jimmerson et al. [22] adapted the notion of IDEAL from Spear and Bowen [43] as follows: Exactly what the patient needs, defect free; One by one, customized to each individual patient; On demand, exactly as requested; Immediate response to problems or changes; No waste; Safe for patients, staff, and clinicians: physically, emotionally, and professionally. Current conditions that are not IDEAL are identified as storm clouds in Step 3 of the Problem-Solving A3 Report. Anything less than IDEAL is considered waste (muda) [21].

In October, 2002 a pilot project of the A3 Method was initiated at the Community Medical Center in Missoula, Montana and subsequently a 7-week training course was developed for employees [22]. Employee efforts in implementing the A3 Method resulted in “significant, medium-scale improvements across many areas of the hospital” [22, p. 251]. Many of the implementations required little or no investment and improved employee efficiency by reducing wasted time. Benefits also included reductions in overtime hours and errors, and improvements in patient, employee and physician satisfaction [22]. The positive reported preliminary results from the use of the A3 Method in a healthcare setting motivated the inclusion of this tool in the EMBA course to expose the students to this valuable tool and give them an opportunity to apply it to a real world example within their own organization. And, we could collect feedback on the ease of use of the A3 Method, as well as its outcomes and performance.

STUDENT PERCEPTIONS AND PROPOSITIONS

The A3 Projects were conducted across a wide variety of departments and processes during the course of the semester. A3 Projects ranged from improving an existing process that was either contained in a department or crossed functional boundaries, or to standardize a process that was poorly defined and executed differently in various departments. It was observed that students at a higher job level had more authority to cross functional boundaries with their A3 Projects, while lower job level students worked on projects within their own functional area. The A3 Projects focused on improving patient care and or patient satisfaction, or improving the efficiency of administrative processes that directly or indirectly impacted patients and employees. Of the seventeen A3 Projects, three students reached Step 9 Test, eleven had a Test scheduled within 3 months, and three did not specify a Test in their A3 Problem Solving Report.

In this paper we do not discuss the specific A3 Projects the students worked on because we do not have permission to do so. Due to the newness of the A3 Method our research is focused on student perceptions of the A3 Method. For that purpose, we conducted a survey to assess healthcare professionals perceptions of the A3 Method for Problem Solving in healthcare. Measurable survey questions utilized a 7-point Likert scale with 1 = strongly disagree; 4 = neither agree nor
disagree; 7 = strongly agree. For all survey items in a cluster we conducted a paired t-test at a 95% confidence level using Minitab. We tested the following hypothesis:

\[ H_0: u_d = u_0 \text{ versus } H_1: u_d \neq u_0 \]

where \( u_d \) is the population mean of the differences and \( u_0 \) is the hypothesized mean of the differences [29]. We report statistical differences between items if the \( p \)-value \( \leq 0.10 \) because: 1) the sample size \( n < 30 \); and 2) we chose an alternative hypothesis of not equal. Increasing the sample size and or using an upper-tailed hypothesis test (greater than) would lower the \( p \)-value. Based on the results of the t-tests we propose hypothesis that can be used in future research to construct models to measure the effectiveness of the A3 Method in improving health care operations. We now discuss our survey results for the clusters based on the seven mudas of healthcare, the hospital work environment, implementation requirements, and A3 Project outcomes.

**The Seven Mudas of Healthcare**

Jimmerson [21] defined seven mudas of healthcare. Since they are specific to the healthcare environment, we wanted to know if the A3 Method was more applicable to any one muda versus another muda. Sixteen students responded to the following survey item: Please indicate your level of agreement with the following statements regarding the A3 Method and the 7 Mudas of Healthcare. Students felt that the A3 Method would have the biggest impact on reducing waiting time in hospital processes, followed by motion, confusion and processing. All four of these mudas have the potential to directly impact patient safety and satisfaction, as well as employee satisfaction with clinical and administrative processes. The two lowest rated mudas of over-production and inventory are unlikely to adversely affect patients or employees. Based on these results we propose the following proposition:

Proposition 1 (P1): Healthcare mudas that directly impact patients and employees will be the focus of A3 Method process improvement projects.

**The Hospital Work Environment**

Survey items in this cluster focused on processes within the hospital and satisfaction with those processes. We asked students to respond to the following statement: Please indicate your level of agreement with the following statements regarding the A3 Method. The results showed that none of the items are significantly different. A t-test between administrative processes and employee job satisfaction had a \( p \)-value = 0.164, which was the lowest of the fifteen possible tests. Due to the small sample size, we did not request stratification data such as job function out of concerns that such information would compromise the anonymity of the respondents. However stratification data could provide additional insights into the survey responses as it is expected that certain mudas and processes would be deemed more important to specific groups. For example, physicians and nurses should be more focused on patient care and safety, while employees who work in administrative areas would be more concerned with employee satisfaction. We make two propositions for hospital work environment.
Proposition 2 (P2): Staff (physicians, nurses, etc.) whose work directly impacts patients will be more focused on improving clinical processes that improve patient safety, care, and satisfaction than staff who work in administrative positions that do not interact directly with patients.

Proposition 3 (P3): Staff whose work directly impacts other employees will be more focused on improving administrative processes that improve efficiency and employee satisfaction than staff who work directly with patients.

**Implementation Requirements**

In this cluster we separated the implementation requirements into three areas: level of management support, knowledge of tools, and employee. We asked the following statement for all three areas: Please indicate your level of agreement with the following statements regarding the A3 Method and implementation requirements. For management support none of the three management levels are significantly different from one another. However, since we do not know the level of the employee responding to these questions, we cannot make a direct inference of the results. However, managerial support is necessary in order to provide an employee with the time to work on an A3 project and we make the following propositions regarding management support.

Proposition 4 (P4): Low level employees require the support of both their immediate supervisor and their department manager to initiate an A3 project.

Proposition 5 (P5): Mid level employees require the support of their immediate supervisor to initiate an A3 project.

Employees need training in process and quality improvement tools so they can use that knowledge to successfully complete an A3 project. For example, before initiating A3 projects at the Community Medical Center in Missoula, Montana employees took a 7-week training course to provide them with the necessary skills [22]. Knowledge of both the basic concepts of lean systems and the basic tools of quality management were statistically different from knowledge of both advanced tools of quality management and advanced concepts of lean systems. These results support our decision to use the A3 Method instead of Six Sigma and leads to the following two propositions.

Proposition 6 (P6): Employees with knowledge of the basic concepts of lean systems and the basic tools of quality management can initiate A3 projects.

Proposition 7 (P7): Implementation of the A3 Method will require less training than required for implementation of Six Sigma.

In addition to managerial support and knowledgeable employees, the A3 method requires employees who are motivated to make their projects a success. Results indicated that an employee commitment to process improvement and an empowered employee are both statistically different from a cross-trained employee. This leads to our next propositions.

Proposition 8 (P8): The more an employee is committed to process improvement, the more successful their A3 project will be.

Proposition 9 (P9): The more empowerment an employee has to make process improvement changes, the more successful their A3 project will be.
A3 Project Outcomes

The objective of this cluster was to determine the learning outcomes from the A3 Projects and we asked the following question: Please indicate your level of agreement with the following statements regarding your A3 Project and Presentation. The overall high average scores indicate that the inclusion of the A3 Projects as part of the course was effective in creating experiential learning. Organizational learning was achieved as the students were able to actually apply the skills they were taught in the classroom to their jobs, which in turn added value to the Lifespan organization. Interestingly, the use of a competition to motivate the students had the lowest score and was significantly different from all the other items. The high standard deviation can be interpreted in two ways. Either the student was highly motivated on their own and did not need a competition for motivation or the student was not interested in being part of the competition. While this result is inconclusive, the competition facilitated the identification of the six best projects that were then discussed in greater detail by the class. And, it was during this second round that organizational learning and value to both the students and Lifespan was reinforced. Some student responses to the open-ended question What were some positive aspects of your A3 Project? were “Good way to apply knowledge gained.”, “Learning from my other cohort’s presentations.”, and “It allowed a visual connection to be made regarding the impact on financials, employees and patients.”. As previously discussed, one of the rationales for the A3 Projects was to add value to the course in order to provide a return on investment in the EMBA Program to the Lifespan Organization. From this we make the following proposition:

Proposition 10 (P10): The implementation of the A3 Method for Problem Solving will add value to the organization by improving the effectiveness and efficiency of hospital processes.

CONCLUSIONS

In this study we have presented the A3 Method, and discussed the results of a survey of the students’ perceptions of using the A3 Method. The survey collected information along several dimensions (such as gathering feedback on the use of A3 Method, how the A3 Method could improve processes if ever, etc.). Based on the student presentations, their A3 reports, and the results from the survey we conclude that the A3 Method is a useful process improvement tool for the healthcare environment.

This research has several implications for both practitioners and academicians. For practitioners we have provided a discussion of the A3 Method for Problem Solving in Healthcare and shown that A3 based projects can be initiated by individual employees with low levels of training in a short period of time (less than three months). For academicians we have discussed how the A3 Method can be used as a framework for student projects during the course of a semester. And, we have proposed a total of ten propositions that can be tested in future research. Currently, this is the only study we are aware of that reports on user’s perceptions of the A3 Method and this research can be expanded by future studies.

A complete paper with literature reviews, a detailed course description and requirements, tables, p-values, references and the survey is available upon request from John Visich