A3 Reports: Tool for Process Improvement

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Abstract

The A3 report is a tool that Toyota Motor Corporation uses to propose solutions to problems, give status reports on ongoing projects, and report results of information gathering activity. In our current research to apply Toyota Production System principles in a hospital setting, we have adapted the A3 problem-solving report for use by hospital staff to improve their organizational processes, and have successfully applied it to numerous problems within a local hospital. This paper presents an A3 report template, and describes the problem-solving approach it represents through an example.

Keywords: Toyota, health care, lean manufacturing, process improvement, problem-solving tool

1. Introduction

Few companies in the world excel at continuous improvement on a corporate-wide basis like Toyota Motor Corporation. Toyota is perhaps best known for its highly effective production system, dubbed "lean manufacturing" by an MIT study in the 1980's [1]. But interestingly, history's most efficient method of production was not born from a sudden brainstorm by an ingenious individual (although Toyota has had plenty of those over the years). Rather, it evolved into its present state over decades of sustained, high level of continuous improvement activity [2]. Toyota's efficiency extends not only to the production floor, but to product development, prototyping, testing, and all other business operations. Manufacturers the world over have been emulating Toyota's practices, and have done so with much success [3]. However, unlike Toyota, much of the success has been confined to the production floor, and little success elsewhere.

Nowhere is efficiency improvement needed more in our society than the health care system. Health care costs in the U.S. are growing at rates that far exceed inflation or wage rates [4]. The health industry is experiencing significant labor shortages in many areas even while it faces dramatic increases in demand as the baby boomer generation ages [5]. Error rates are shockingly high [6]. As a consequence, many have claimed that we are in a health care crisis.

The health care industry is not standing by idle [7]. Continuous quality improvement (CQI), health care's equivalent of total quality management, is pervasive and quality management departments are ubiquitous. Health care administrators are very conscious of costs, waste, and inefficiency, and evidence of continuous improvement is high in the priorities of health care accreditation agencies. Yet it seems all of this has done little to stem the tide. Could Toyota's production system, if applied to health care, be more efficacious than other efforts? At first brush, it would seem highly likely that a direct application of TPS tools (like kanban, poka yoke concepts, etc.) would not be very successful because the environments of high volume manufacturing and hospitals are quite different. But careful consideration of the tools and why they work, then adapting the appropriate tools to a hospital environment may result in significant breakthroughs in operational efficiency while improving the quality of care. This is the aim of an ongoing partnership between Montana State University in Bozeman, MT and Community Medical Center in Missoula, MT.

Many of Toyota's tools and practices have been studied, written about, and copied, but our efforts have focused on a tool that has received little attention. In prior work researching Toyota's product development system, the first author found this tool to be used pervasively and with incredible power and effectiveness [8]. Toyota uses it to systematically guide problem-solvers through a rigorous process, document the key outcomes of that process, and propose improvements. The tool is used so pervasively that it forms a keystone in Toyota's world-famous continuous improvement program. Toyota calls this tool the A3 report.

2. The A3 Problem-Solving Report

The A3 report is so named because it is written on an A3 sized paper (metric equivalent of 11" x 17"). Toyota has developed several kinds of A3 reports for different applications. We have adapted the problem-solving report for use by health care workers, most of whom do not have engineering or business backgrounds. A template for our version of the A3 problem-solving report can be obtained from the authors. The report flows from top to bottom on the left-hand side, then top to bottom on the right-hand side. A three-hole punch on the left-hand combined with a tri-fold enables A3 reports to be stored in standard three-ring binders. While the names of the boxes can change, the basic storyline of the report remains the same, as will be explained in the following subsections.

2.1. Theme & Background

Every report starts with a "theme" or title. The theme indicates the problem being addressed, and is fairly descriptive. The theme should focus on the problem, and not advocate a particular solution (e.g., "Interruptions to Pharmacists work resulting in long turn-around times," not, "Hospital units calling instead of faxing inquiries to Pharmacy").

Next, the A3 report author describes any pertinent background information that is essential to understanding the extent and importance of the problem. Items that might be included in this section are how the problem was discovered, why the problem is important to the organization's goals, the various parties involved, the problem symptoms, past performance or experience, organization structure, and so forth.

2.2. Current Condition

This section is perhaps the most important section in the A3 report. The author draws a diagram that depicts how the system that produced the problem currently works. Problems are highlighted on the diagram with storm bursts. Also, the author should quantify the extent of the problem (e.g., percent defects, hours of downtime, etc.), and display this information graphically or numerically somewhere in the current condition. The diagrams should be neatly drawn, and readily understandable to any knowledgeable reader. Helpful toward this end is a set of standard icons for different entities. We have developed a set of icons useful for hospitals, but any set of simple, easy-to-draw, yet descriptive icons will work.

The data used to develop the current condition diagram are collected through *direct observation*. In-depth and detailed understanding of the current process as it is actually performed, rather than how it should be done or how someone says it is done, is absolutely critical. Workers and supervisors can often describe how the process generally works, or how it is supposed to work, but deviations from this general or hypothetical conception usually hold the key to addressing the problem. So direct observation is needed. The data for describing the extent of the problem should also be actual data, perhaps collected in a logbook if necessary, not educated guesses.

The purposes of diagramming and quantifying the problem are several. First, the act of drawing a diagram enables deeper understanding by helping the author organize knowledge and learning gained from observation compactly. Second, the diagram quickly and effectively communicates the core issues to others. The graphical medium can contain a very dense amount of information, and yet readers can pick it up quickly because of the pictorial representation. Thirdly, by diagramming the system, problem-solving efforts are focused on the system rather than the people. It results in a more objective approach with less defensive posturing and finger-pointing. Our experience has been that problem-solving efforts often fail in implementation because the author(s) did not sufficiently understand the current condition. Rarely is failure due to incompetence or lack of ingenuity.

2.3. Root Cause Analysis

As the author comes to understand the current condition in a deep and meaningful way, it becomes imperative that s/he comes to understand the root cause of the problem symptoms shown as storm bursts in the current condition diagram. Failing to address the deeply rooted seed of the problem means it will likely recur. A common technique for root cause analysis is the "5 Why's" method. The problem-solver simply asks a why question approximately five times in series. Experience has shown that stopping at two or three why's usually means that the inquiry has not gone deep enough. One possible guide is whether the inquiry touches on at least one of three basic principles for design of organizational systems: 1) Are work *activities* sufficiently specified according to content, sequence, timing, and outcome? 2) Are *connections* between entities clear, direct, and immediately comprehended? 3) Are the *pathways* along which goods/services travel simple, direct, and uninterrupted; are all the steps value-added? Spear and Bowen [9] identified these principles as the DNA of the Toyota Production System in their extensive study. We have yet to encounter a failing system that does not violate at least one of these principles. So to help guide the 5 why's inquiry, the problem-solver might consider whether activities, connections, or pathways are at the root of the problem.

2.4. Target Condition

Now that the problem-solver has a keen understanding of how the work currently gets done, and has a good grasp of the root cause(s) of the problems experienced with the system, s/he is now ready to consider how the system might be improved. Toyota calls the improvements *countermeasures* (rather than the ubiquitous "solutions") because it implies that a) we are countering a specific problem, and b) it is what we will use now until we discover an even better countermeasure. The countermeasures address the root cause(s) while conforming to the three design principles. The goal is to move the organization closer to an ideal state of providing exactly what the customer (patient) needs, safely, when needed, in precisely the right quantity, and without waste.

With countermeasures in mind, the author draws a diagram of the target condition; that is, a diagram of how the envisioned system will work with the countermeasures in place. The countermeasures can be noted on the diagram as fluffy clouds, or noted separately. Like the current condition, the target condition diagram should be neat and clear to all who read the report.

2.5. Implementation Plan

The implementation plan outlines the steps that must be accomplished in order to realize the target condition. The author lists the steps, when they need to be done, and who is responsible. Since implementation is an activity, it should conform to the activity design principle (i.e., specify the content, sequence, timing, and outcome).

2.6. Follow-up Plan

How will the organization know that the new system is actually better than the old? The follow-up plan indicates how and when the author (or other designate) will measure the improvement of the system or the results of a specific test. It should include a realistic and quantified prediction of how the new system will perform (e.g., X% decrease in defects, or turnaround time reduced to Y minutes). The prediction should be as accurate as possible, based upon the author's deep understanding of the work and the countermeasures planned. It should not be a shot in the dark, or an unrealistically ideal case. For example, while ideally we would like to see zero defects, will the countermeasures envisioned realistically achieve zero defects? If not, how many defects can we expect with the new system?

2.7. Results Report

This section is an adaptation to Toyota's A3 report system. Toyota problem-solvers draft a special A3 status report to report on follow-up results. It is fairly extensive, including a list of shortcomings and plans to address them. We decided to incorporate the reporting of results on the original A3 in order to simplify the A3 report system and increase its acceptability. So we leave space at the end of the A3 report to record the actual results in comparison to predictions. If the new system still has problems, then another A3 problem-solving report can be generated.

The follow-up results reporting step is absolutely critical to maximizing learning within the organization. As Spear and Bowen [9] elucidate, Toyota indoctrinates its people with its own version of the scientific method—every improvement is designed as an experiment. The A3 problem-solving process is a structure to implement the scientific method. The current condition and root cause constitute the necessary background research, the target condition and implementation plan outline the experimental design, and the follow-up plan states the hypothesis. So the results reporting section is critically important for evaluating whether the hypothesis is supported. If so, we confirm our understanding and move on to the next problem. If not, we know that our present understanding of the work is incorrect or insufficient, and additional background work is needed. If we fail to make the hypothesis, or if we fail to measure the results, we have no real test of our understanding, and as Lord Kelvin once said, our knowledge will be of a meager and unsatisfactory sort.

3. An Example

We illustrate the A3 problem-solving process described in the previous section with an actual A3 report used to address a difficult interdepartmental issue. Patient bills from the emergency department were being delayed. To actually generate a bill, the patient's medical file (or chart) must be "coded," that is, assigned a numerical code for each service rendered for the purposes of insurance billing. Coders need a transcription of the physician's dictation of the visit to ensure the accuracy of the coding, and to comply with accreditation regulations. Emergency Department dictations are transcribed by a third party (Ultramed), and the transcriptions are then downloaded in the Health Information Management (HIM) Department who does the coding for all hospital patient accounts. Upon investigation, one reason for delayed billing was in receiving transcriptions and matching them to patient files.

The theme of the report became that HIM coders were unaware of transcriptions that had arrived. Frequently transcriptions could be available from the third-party transcriber and even downloaded, but would not get matched with patient files. Thus, patient files waited in queue unnecessarily resulting in delays. In addition, the background section indicated that HIM staff spent significant effort keeping track of patient files and transcriptions, following up on late dictations, and so forth.

A graduate research assistant, in an effort to learn the A3 process, observed first-hand what happens to patient charts and transcriptions after the patient is discharged from the emergency room (ER). In addition, he informally interviewed HIM coders and supervisors, and ER physicians, nurses, and technicians to make sure no steps were missed, and to uncover aberrations to the general procedure. Figure 1 displays the current condition diagram that summarizes his understanding of the process. The diagram plainly shows a fairly complex process to match dictations with charts, with numerous work around loops and opportunities for error. The large starburst points out that transcriptions can be available without HIM's knowledge. In one day's exception report for delayed bills, 17 charts were identified as awaiting transcriptions in HIM, but of those, 7 transcriptions were already present in HIM! In other words, seven transcriptions had been made, but had somehow become lost or misplaced in the system thus delaying bill processing on those accounts.

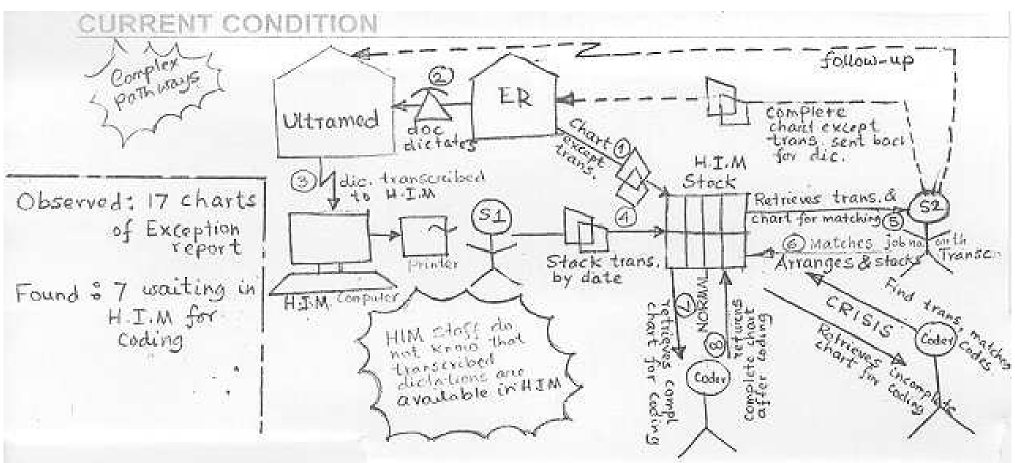

FIGURE 1: EXAMPLE OF CURRENT CONDITION

As the team investigated why chart coding was being delayed, the root cause analysis concluded that unclear signals and convoluted pathways made it difficult for the HIM staff to manage the flow of charts through their department. No one could see easily where charts needed to go next. It also became apparent that the system lacked clear signals for indicating when ER physicians had done their dictations, when transcriptions were ready for download, or when transcriptions had been downloaded but not yet mated with patient charts.

After considering a number of options, the primary countermeasure selected was to receive the transcriptions in the emergency department and mate them with patient charts before sending them to HIM. This would eliminate the set of work around loops in HIM altogether, and cut down confusion because the emergency department is in a much better position to manage the third-party transcriptionists (i.e., they know whether a dictation has been made and when). The process becomes greatly simplified, as shown in Figure 4.

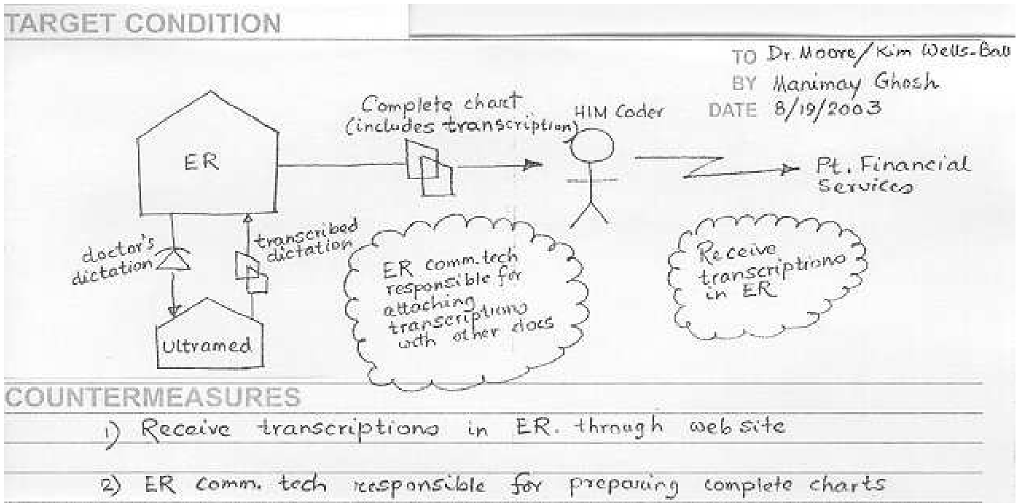

FIGURE 2: EXAMPLE OF TARGET CONDITION

The next step was to devise an implementation plan so that the new procedure could be put into place with minimal disruption and maximum likelihood of success. A critical step was to work with the information systems department to set up the necessary hardware and network link to accomplish the move. Representatives from both the ER and HIM participated. In the end, all that was needed was to move the computer and printer dedicated to transcription downloads to the ER, and connect it to the hospital's network. The remaining three steps were to communicate the change and train the ER doctors and ER and HIM staff in the new procedures.

The follow-up plan for this A3 report was fairly simple. After the implementation date of September 1, the hypothesis was that 100% of charts from ED would reach HIM with transcriptions, and that the bill drop time would drop to 7 days or less. Approximately six weeks later, 98% of the 371 emergency department charts processed over a two-week period arrived at HIM with transcriptions. The bill drop time was 6.6 days.

4. Benefits / Why it works

We have successfully applied the A3 tool on dozens of problems in a health care setting. We have been able to resolve problems that had been attempted (unsuccessfully) in the past using other problem-solving methods. We hypothesize that the success stemming from use of A3 reports is due to several key factors. First, unlike most other approaches, the A3 method demands the documentation of how the work actually happens. The best (and probably most credible) way to document the actual work is to observe it first hand. Recreating the process from memory in a conference room removed from the where the work physically occurs will result in inaccuracies and overgeneralizations. Most often, it's the aberrations and the small, easily overlooked details of the workplace that cause the inefficiencies or quality issues.

Second, A3 reports enable the people closest to the work to solve problems rather than just work around them. The A3 reports do not require long hours of specialized training. They can be drafted with pencil and paper, so would-be problem solvers do not need access to a computer. This enables problem-solving to occur as close to the work as possible so that the fix matches the work. Toyota does not distinguish between people who do the work and people who solve problems. Everybody's job is to solve problems and improve.

Third, the iconic nature of the process diagrams makes them a closer representation of the actual systems compared to other process representations such as flow charts. As such, authors are able to "see" their problems more clearly and readers grasp the systems more readily. In addition, these diagrams serve as highly effective boundary objects between individuals and organizational units. Having a physical artifact that both sides can literally point to and discuss facilitates communication and knowledge sharing [10].

Finally, the A3 report represents a thorough problem-solving approach, from problem identification to analysis and solution generation, all the way through implementation planning and follow-up. Yet, it is succinct—two letter-sized pages. The combination is powerful. Plus, concisely documenting process improvement and follow-up results enables sustained organizational learning while meeting the requirements of accreditation. In other words, the documentation is a necessary part of the process, not an added burden to be hastily completed after the fact (often long after the shift is over!).

5. Conclusions

The A3 problem-solving report, adapted from Toyota, is a potentially useful tool for organization-wide continuous improvement. It simultaneously documents the key results of problem-solving efforts in a concise manner and embodies a thorough problem-solving methodology that begins with a deep understanding of the way the work is currently done. When implemented properly, the approach pushes the organization toward system-wide rather than local optimization as the problem-solver seeks input and ultimately consensus from all parties affected by the proposed change. In taking as many system issues into consideration as possible, the problem-solver attempts to propose countermeasures that help the organization move one step closer toward ideal.

While the A3 report can be a powerful tool for promoting fast and effective process improvement, it is not a magic wand. Implementing the tool requires conscious effort, and numerous obstacles must be overcome. Perhaps the most common issue we've encountered is simply making the time to do the problem solving. One possible countermeasure to this problem is to provide extra support temporarily in order to get the A3 process initiated. As problems are addressed and processes are streamlined, time spent on wasteful activities is freed up for problem solving. The extra support can then be diverted to another organizational unit.

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