Design and Implementation of TAVA – Training Attendance Verification Automation for Non-QMS Documents with MES Configuration at a Medical Device Industry

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Abstract *— The training process in manufacturing systems, especially in complex environments like MES dispatch, is vital for operational efficiency. At Medtronic's Juncos facility, current training practices have caused delays, inefficiencies, and increased error rates. This study investigates training challenges, including LMS transaction inefficiencies, manual data entry, and lengthy reconciliation times. Using the DMAIC (Define, Measure, Analyze, Improve, Control) methodology, the research targets process improvements, particularly for non-QMS documents configured with MES dispatch. Goals include reducing reconciliation lead times, minimizing errors, and improving overall efficiency. Key findings highlight automation, standardization, and real-time monitoring as essential solutions. The proposed improvements are scalable, enabling adoption across other business units to ensure consistent and efficient training practices throughout Medtronic. A significant anticipated outcome is reducing lead time from 134 minutes to 1 minute for 600 employees, accelerating change implementation and minimizing disruptions. Ultimately, the study emphasizes the value of structured problem-solving in advancing manufacturing training systems.*

Key Terms *— DMAIC Method, MES Dispatch, Quality Management System, Training Attendance Automation.*

PROBLEM STATEMENT

In this section, we will thoroughly discuss the challenges faced within the current training process for MPR_QSM_WI_009105, specifically regarding documents configured with MES dispatch. As part of this process, the person being trained must complete a training attendance form, which allows the training staff to grant the training in Cornerstone and ensures that only trained personnel are *authorized* to execute the task. However, as the different Medtronic businesses in Juncos continue to grow, the existing training process for documents with MES dispatch configurations has become increasingly complex, resulting in significant delays (5 to 7 additional days) for Learning Management System (LMS) transactions and an increased risk of errors.

This process causes interruptions in the manufacturing production areas and delays the implementation of important changes, such as New Product Introductions (NPI). Furthermore, the costs associated with printing and storing multiple training attendance forms add to the overall inefficiency. Additionally, there is an extended lead time for the reconciliation process for Non-QMS Documents with MES Dispatch configurations.

Given these challenges, the need arises to streamline the training process. This project aligns with the principles of Improvement Excellence by employing problem-solving methodologies to identify and eliminate the root causes of inefficiencies in the training process for documents with MES dispatch configurations. The goal is to reduce lead time by 70%, resulting in a more efficient and sustainable process.

RESEARCH DESCRIPTION

Every time a change in procedure occurs that requires training, the training team must ensure that all personnel are adequately trained and authorized to execute specific tasks related to documents configured with MES dispatch. As part of this process, everyone being trained must complete a training attendance form, which allows the training staff to grant the training in Cornerstone and ensures that only qualified personnel can perform

the required tasks. However, with the growing demands of Medtronic businesses in Juncos, the current training process has become increasingly complex, leading to significant delays of 5 to 7 additional days in Learning Management System (LMS) transactions and increased risk of errors.

The challenge is to streamline this process to reduce inefficiencies and delays. During this research period, the focus was placed on investigating the root causes of these inefficiencies and exploring solutions to address them. The study also involved researching how problem-solving methodologies, such as the DMAIC (Define, Measure, Analyze, Improve, Control) methodology, could support the design and implementation of a more efficient training process for documents configured with MES dispatch. The goal was to reduce the lead time and improve the overall accuracy and sustainability of the training process while addressing the complexities caused by growing business needs

RESEARCH TIMELINE

The research and development for improving the training process for MPR_QSM_WI_009105, particularly for documents with MES dispatch configurations, was conducted over the course of one month. This timeline includes additional tasks such as SIOQ review, RCH and item number assignment, execution, SIOR, scanner acquisition for the Juncos site, and updating the MPR_QSM_WI_009105 to include TAVA instructions. Below is the detailed research timeline:

Initial Research Phase (Week 1: December 2, 2024 – December 8, 2024)

Objective: Analyze the existing training process and identify inefficiencies related to documents configured with MES dispatch.

Actions:

- Reviewed the current process for completing training attendance forms, assigning PCH and item numbers, and determining the execution of tasks.
- Investigated challenges such as delays (5 to 7 days) in Learning Management System (LMS) transactions and errors during the reconciliation process.
- Started evaluating the need for scanner acquisition for the Juncos site to improve document tracking and reduce manual effort.

Data Collection and Stakeholder Input (Week 2: December 9, 2024 – December 15, 2024)

Objective: Collect detailed insights from stakeholders and gather feedback on existing training inefficiencies.

Actions:

- Carryout time studies for the reconciliation process for 5 samples and held interviews with training staff and personnel involved in the MES dispatch documents and training processes.
- Focused on the impact of extended delays and the manual effort required for PCH reconciliation process.
- Collected input on the scanning system's potential for streamlining the process and improving tracking at the Juncos site.
- Compiled data on costs and inefficiencies related to the current paper-based training attendance process.

Design Phase (Week 3: December 16, 2024 – December 22, 2024)

Objective: Design and plan improvements to streamline the training process and incorporate necessary changes, including scanner acquisition and the update to MPR_QSM_WI_009105.

Actions:

- Created a draft of the updated training process, incorporating automated tracking and eliminating manual steps for reconciliation process.
- Updated the MPR_QSM_WI_009105 to include TAVA instructions, ensuring the

document reflects the necessary changes in the process.

- Developed a proposal for acquiring scanners for the Juncos site to facilitate automated data capture and reduce delays.

Pilot Testing and Feedback (Week 4 & 5: December 23, 2024 – January 05, 2025)

Objective: Test the proposed changes and gather feedback for final adjustments.

Actions:

- Conducted a pilot test of the revised training process with the new scanner acquisition and the updated MPR_QSM_WI_009105 to include TAVA instructions.
- Gathered feedback from stakeholders on the effectiveness of the automated process, including the use of scanners and the updated training instructions.
- Monitored the success of the implementation of the updated process in improving efficiency and reducing delays.
- Made necessary adjustments based on feedback to ensure the process was efficient, streamlined, and aligned with Improvement Excellence goals.

This timeline captures the entire research and development process, from initial analysis to the incorporation of the updated MPR_QSM_WI_009105, scanner acquisition, and other process improvements. The outcome was aimed at addressing inefficiencies, reducing delays, and improving the overall sustainability and accuracy of the training process.

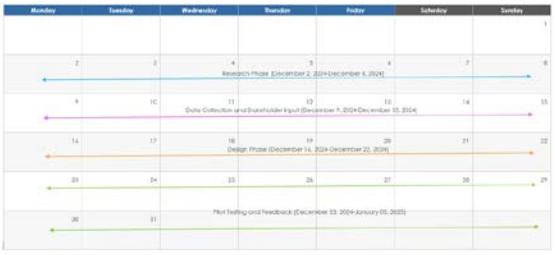

Figure 1
Project Timeline in December 2024

RESEARCH CONTRIBUTIONS

As part of the research contributions, applying problem-solving methodologies, such as DMAIC, greatly helped us to address and resolve the challenges associated with the training process for MPR_QSM_WI_009105, particularly for documents configured with MES dispatch. This methodology was essential in identifying the root causes of inefficiencies, such as delays in Learning Management System (LMS) transactions, manual processes, and errors that contribute to interruptions in manufacturing production areas.

By designing a more streamlined and automated training process, the project aims to reduce implementation delays by 70%, improving the overall training system's efficiency. One of the key aspects of this contribution is the development of a solution that minimizes the time required for processing training attendance and document reconciliation, thereby reducing operational disruptions. Additionally, the new process is expected to reduce costs related to printing and storing multiple training attendance forms.

Once successfully implemented, this improved training process will be continuously monitored, and a dedicated role will be established to manage the training process and ensure its effectiveness. This role will contribute to the ongoing improvement of the training system and help in the development of career paths within the organization. The streamlined process is also intended to be adopted across other business units by 2023, ensuring that all personnel are trained efficiently while minimizing disruptions and delays in the implementation of important changes, such as New Product Introductions (NPI).

LITERATURE REVIEW

This section focuses on the importance of streamlining training processes, particularly within the context of manufacturing environments, where efficient training is crucial for maintaining production continuity. The training process for personnel handling documents configured with

MES dispatch has become increasingly complex, especially as the business environment grows and becomes more dynamic. The role of efficient training and how to manage it correctly becomes even more critical in environments where the operational pace and business demands are rapidly increasing. This chapter explores the significance of optimizing training systems, particularly for Learning Management Systems (LMS), and investigates the methodologies that can aid in improving these processes. After reviewing the literature, it becomes clear that an efficient training process is not only necessary for compliance but also essential for operational success, minimizing delays, and improving overall productivity.

Training in manufacturing environments plays a pivotal role in ensuring that personnel are not only skilled but also compliant with regulatory requirements. Studies have shown that well-structured training programs lead to improved productivity, reduced errors, and higher employee satisfaction context of document handling for MES dispatch, training ensures that employees are authorized and capable of executing specific tasks without causing delays in the production flow. When personnel are properly trained, the likelihood of operational disruptions due to errors or delays decreases significantly. [1] Furthermore, an effective training system is closely linked to overall manufacturing efficiency, [2] as it supports faster adaptation to changes such as new product introductions (NPI), which are crucial to a company's competitiveness and growth.

[3] The inefficiencies within current training processes can often be traced back to several factors. Manual processes, for instance, are frequently cited as significant contributors to delays in LMS transactions, particularly when data needs to be manually entered or reconciled between different systems. [4] According to research, manual data entry leads to a 25-40% increase in processing time, which compounds delays in document-related training tasks. Moreover, fragments that lack integration between various training platforms, such as training attendance forms and Cornerstone (or similar LMS), exacerbate this problem, creating additional layers of complexity that slow down training completion times and increase the risk of errors. Inefficiencies arising from these root causes not only delay the authorization process but also increase the potential for errors that could disrupt critical production activities.

Recent studies highlight that automation is one of the most effective solutions for improving training systems and eliminating inefficiencies. By automating repetitive tasks, such as attendance tracking and training status updates, manufacturers can reduce manual intervention, leading to faster and more accurate results. Automation also helps reduce the associated with manual data input, which is critical in environments where mistakes can result in significant operational disruptions. Automation allows for the seamless flow of information between training platforms and other systems such as MES dispatch, ensuring that the correct data is always up to date and synchronized across all platforms. [5] Studies also suggest that automating training processes can cut training time by up to 30%, improving overall efficiency and minimizing the risk of production delays.

The streamlined training process also helps reduce operational costs. In addition to reducing delays and improving accuracy, automating tasks eliminates the need for paper-based training attendance forms and manual record-keeping, which can incur significant costs for organizations. [6] According to a report by the International Society for Performance Improvement, companies that shifted from paper-based systems to digital training and tracking systems experienced a 40-50% reduction in associated administrative costs. Furthermore, by eliminating the need to store and me volumes of physical documents, companies can reduce storage space requirements and improve document retrieval times, contributing to overall cost savings. This reduction in costs is particularly important in highly competitive and cost-sensitive industries, where operational efficiency directly impacts profitability.

[7] A crucial aspect of any streamlined training process is the ability to monitor its effectiveness over time. [8] Research on continuous improvement methodologies, such as Six Sigma and Lean, underscores the importance of ongoing monitoring to identify potential inefficiencies and improve processes iteratively. Implementing a dedicated role to oversee training processes, ed in this study, allows organizations to proactively address challenges, gather feedback, and implement corrective actions when needed. This role ensures that training systems remain aligned with business objectives and can adapt to new challenges or regulatory requirements. Furthermore, continuous monitoring allows for the early identification of emerging trends in training performance, enabling managers to take corrective action before small inefficiencies turn into larger, more costly issues.

The scalability of an improved training process is another key benefit, as highlighted by several studies. [9] Once a streamlined training system is successfully implemented in one business unit, it can be replicated across other units, ensuring that training processes are uniform and efficient across the organization. This is particularly important for multinational organizations or those with education facilities, where maintaining consistent training standards is essential. [10] As businesses expand and face new challenges, having a flexible, automated, and scalable training system will be crucial in ensuring that all personnel are adequately trained, especially when dealing with high stakes changes like NPIs.

METHODOLOGY

To design and implement the Training Attendance Verification Automation for the training team, the DMAIC methodology was applied. This methodology, part of the Six Sigma toolkit, is designed to drive continuous improvement in processes. The DMAIC acronym stands for the five phases that compose the methodology: define, measure, analyze, improve, and control. Table 2 provides a brief overview of these five phases in the DMAIC methodology.

Table 1
DMAIC Methodology Streamlining the Training Process

Phase	Definition
Define	Set clear goals and define the desired outcomes of the training process.
Measure	Assess the current training process to identify inefficiencies and bottlenecks.
Analyze	Examine the data to understand the root causes of inefficiencies and delays.
Improve	Develop and test improvements to the training process to address identified issues.
Control	Ensure that the improvements are sustained and that the new training process remains efficient over time.

The DMAIC methodology is designed for improving existing processes to meet specific performance objectives. Unlike the DMADV methodology, which is used when developing new processes, DMAIC is focused on enhancing processes that are already in place. The first three phases—Define, Measure, and Analyze—are like those of DMADV, as they help identify issues and gather the necessary data. However, DMAIC diverges in its final two phases: Improve and Control. These phases emphasize refining the process and ensuring that improvements are sustained over time. The benefit of DMAIC over other quality control approaches is its structured, data-driven nature, which focuses on identifying the root causes of inefficiencies before proposing solutions. This methodology is customer-driven, ensuring that improvements align with customer needs and expectations. While DMAIC is linear in its five phases, it is also iterative, allowing organizations to revisit and refine solutions based on ongoing results and feedback. [11] By focusing on data analysis and continuous improvement, DMAIC ensures that the process enhancements are both effective and sustainable, making it an ideal approach for streamlining processes in a variety of business settings.

- **Define phase:** The Define phase is the foundation of the DMAIC methodology, where the problem is clearly identified, and the project's goals, scope, and objectives are established. In this phase, teams focus on defining the problem that needs solving, understanding the customer’s needs, and clarifying the process that needs improvement.

A project charter is often developed to formalize the project's purpose, timeline, and key milestones. High-level process maps or flow diagrams are used to give a clear overview of the process and the areas that require improvement. By defining the problem in precise terms, this phase sets the stage for the rest of the process, ensuring that everyone involved understands what is being solved and why it matters.

- **Measure phase:** In the Measure phase, the current state of the process is thoroughly assessed to collect baseline data, which helps identify performance gaps and provides insight into where improvements are needed. This phase involves determining which metrics or key performance indicators (KPIs) will be used to assess the process's effectiveness. Data is collected in a systematic and accurate manner to ensure that it reflects the true performance of the process. Tools like control charts or histograms might be used to analyze the variation in the process. Measurement systems are also evaluated for reliability and validity to ensure that the data gathered is credible. This phase helps teams understand the magnitude of the problem and sets benchmarks for success.
- **Analyze phase:** The Analyze phase is where the root causes of the identified problems are examined and understood. This is a critical step in the DMAIC methodology because identifying the true underlying causes of variation or inefficiency is essential for making effective improvements. During this phase, various analytical tools like Pareto charts, cause-and-effect diagrams (fishbone diagrams), and statistical methods are used to dig deep into the data collected during the Measure phase. The goal is to understand why the problem exists, isolating specific factors contributing to process inefficiencies. By analyzing the data and identifying patterns, teams can pinpoint areas that need change and develop solutions that address the root causes rather than just treating symptoms.
- **Improve phase:** Once the root causes are identified, the Improve phase focuses on designing and implementing solutions to eliminate the issues and enhance process performance. During this stage, brainstorming sessions often generate potential solutions, which are then evaluated for feasibility, cost-effectiveness, and impact. Pilot tests and simulations may be conducted to ensure that the solutions will work in practice before full-scale implementation. Process modifications or new strategies are then put into place, such as streamlining operations, introducing new technologies, or changing workflows. The goal is to implement sustainable improvements that solve the problem and elevate the process to the desired level of performance. Documentation of the new process and training for staff may also be part of this phase.
- **Control phase:** The Control phase ensures that the improvements made during the Improve phase are sustained over time. In this phase, systems are put in place to monitor the process continuously and ensure that the new improvements are maintained. Control plans are developed, outlining the steps for ongoing process monitoring and ensuring that any variations or deviations from the desired process are quickly identified and addressed. Tools like control charts and dashboards are often used to track key metrics and ensure that the process stays on track. Employees are trained to follow the new procedures, and regular audits or reviews are conducted to assess the long-term effectiveness of the improvements. By establishing control mechanisms, this phase ensures that the improvements are not temporary but become a stable part of the organization's operations.

RESULTS AND DISCUSSION

This section presents the analysis of the results and discusses the problem established, as well as how the design and implementation of the Training

Attendance Verification Automation tool was achieved using the DMAIC methodology.

Define

In this section, we will define the goal of this research using DMAIC methodology for the design of Training Attendance Verification Automation "TAVA". In the Define phase, the core problem that needs to be solved is clearly articulated. In this case, the problem is identified as the inefficient and error-prone training process for documents configured with MES Dispatch. This process, currently causing delays in Learning Management System (LMS) transactions, results in additional lead times of 5 to 7 days, which disrupts the production areas within manufacturing and delays the implementation of critical changes, such as New Product Introductions (NPIs). Furthermore, the current process leads to unnecessary costs due to the requirement to print and store multiple training attendance forms, adding to the inefficiency. The Project Y for this initiative is focused on reducing the lead time associated with the reconciliation process for Non-QMS Documents configured with MES Dispatch. The target is to reduce the lead time from 134 minutes to just 1 minute for a population of 600 employees, ensuring that the system operates more effectively and seamlessly. The project scope is specifically focused on Non-QMS Documents with MES Dispatch configurations, excluding documents without these configurations or those that do not impact manufacturing. The goal of this phase is to achieve the lead time reduction by January 31, 2025, aligning the project with the business strategy of Improvement Excellence to streamline and optimize the process.

Measure

In the Measure phase, the first step is to create a detailed process map (figure 2) that outlines the flow of the actual training process. This map highlights all the key steps involved, from collecting attendance data to finalizing and reconciling that data in the system. Upon reviewing the map, the reconciliation process stands out as the critical step that significantly impacts the overall performance and causes delays. This is where the greatest inefficiency lies, and it is identified as the primary area to improve.

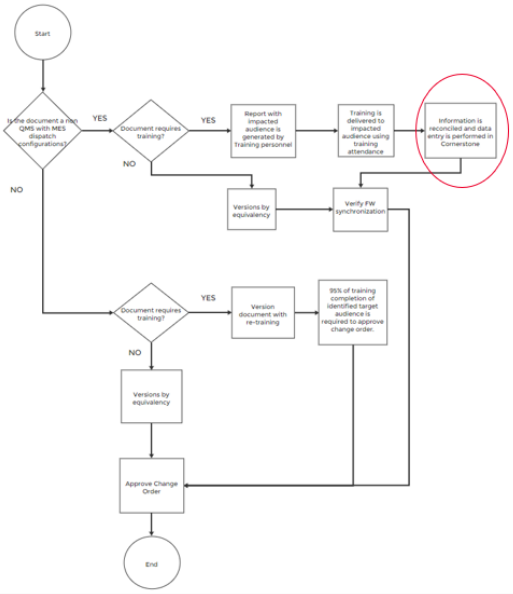

Figure 2
Process Map for Current Training Process Non-QMS Documents with MES Dispatch

To better understand the context of the training process, we create a SIPOC diagram (figure 3), which provides a high-level overview of the key components of the process. This helps identify what inputs are feeding into the reconciliation, the process steps, and who the final customers or stakeholders are. Here's how the SIPOC diagram looks when we focus on the actual training process for non-QMS documents with MES Dispatch.

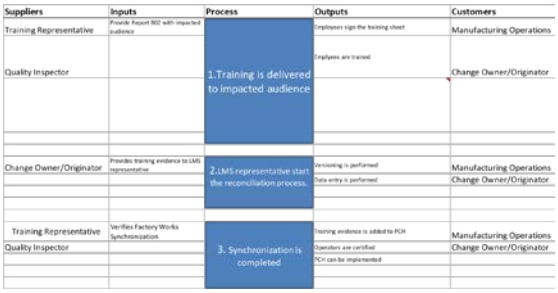

Figure 3
SIPOC Diagram

Next, we use a Fishbone Diagram (figure 4) to dive deeper into the root causes of inefficiencies in

the actual training process for non-QMS documents with MES Dispatch. This diagram categorizes potential causes into various categories like People, Process, Machine, Materials, Measurement and Environment, and helps to pinpoint the specific factors contributing to delays and errors in this critical step.

Here is a potential Fishbone Diagram for the Training Process for non-QMS:

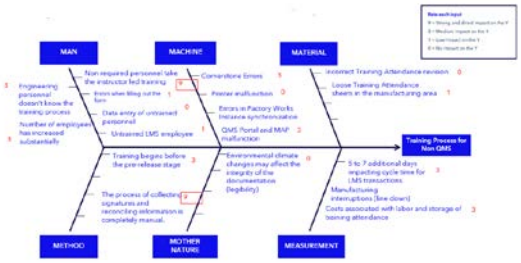

Figure 4
Likely Suspects Taken from Various Inputs Received

The root causes of the identified critical factors are primarily driven by People and Method inefficiencies.

People: The issue of non-required personnel attending training creates unnecessary records and signatures, which significantly increases the workload for reconciliation. This not only leads to unnecessary data being processed but also causes delays and complications in tracking attendance accurately. Additionally, there is a lack of proper training for employees on how to manage this data efficiently, contributing to mistakes and slowdowns during the reconciliation process.

Process: The manual process of collecting signatures and reconciling data is another significant bottleneck. Without automation, this process becomes time-consuming and error-prone, as it relies heavily on manual data entry and validation. This introduces potential for mistakes, duplicate entries, and increased processing time, all of which contribute to delays in finalizing training records and updating systems. The absence of streamlined processes or tools exacerbates the inefficiencies, making it harder to keep track of training data in an accurate and timely manner.

In the Measure phase, the performance of the current process is evaluated to establish a baseline and understand where improvements can be made. In this case, we are assessing the reconciliation process for Non-QMS documents with MES dispatch configurations. The current lead time for the reconciliation process is 13.4 seconds per employee, with a typical population of 600 employees per non-QMS document. This data is critical to identify inefficiencies in the existing process.

To ensure the accuracy of the measurements, we conducted time studies by sampling five different sets of data. Each sample was collected to capture the actual time spent during the reconciliation process. These time studies reveal a clear baseline for how much time is currently required, highlighting that the process is taking a total of 67.3 seconds across the five samples for reconciliation for a document, equating to 8076 seconds for a population of 600 employees. This results in an average time of 13.45 seconds per employee.

Table 2
Time Studies Performed (Training Process Without TAVA) for PCH00138846

Description	Population	Time (s)	Time per employee (s)
PCH00138846	11	148	13.45

Table 3
Time Studies Performed (Training Process Without TAVA)

	Sample (s)							
Description:	1	2	3	4	5	Total	Total = 600 people	(min)
Time to complete training attendance	14	14	15	16	13	72	8640	144
Time for reconciliation process	13.3	14	13	14	13	67.3	8076	134.6
Target for training attendance completion	5	5	5	5	5			
Target for reconciliation process	3	3	3	3	3			
Total time (Reconciliation)	8073	s						
Population	600							
Avg time for reconciliation process	13.45455	s						

The data from the time studies is summarized in the following tables. These measurements provide us with a solid understanding of the current state and a foundation for identifying opportunities for improvement. Additionally, target times have been set for training attendance completion and reconciliation process, aiming to reduce the times

significantly in the upcoming phases. The baseline data forms the basis for measuring improvements in the following steps of the DMAIC process.

Analyze

The Analyze phase is crucial for identifying the root causes of inefficiencies and analyzing the data to ensure that the process improvements meet the defined objectives. In this phase, the goal is to examine the factors that impact the current process performance and to validate whether the current approach is aligned with the specified requirements. For example, in the case of streamlining the training process, we need to analyze the inefficiencies, such as unnecessary personnel attending instructor-led training and the manual nature of the reconciliation process. By examining these issues, we can assess how they contribute to delays and errors in the system. This analysis helps to establish a clear understanding of what needs to be improved, ensuring that the final solution will meet the desired goals, such as reducing lead time and improving accuracy. By collecting and analyzing the data from time studies, as well as reviewing process inputs, we can validate how the proposed improvements align with the training process needs defined earlier.

Table 4
Likely Suspects

Inputs	Evidence	Key?
Non required personnel take the instructor led training	17% of the audience didn't require the Instructor Led. This is 102 employees for an average population of 600. This is equal to 23 more minutes for the reconciliation process.	Yes
The process of collecting signatures and reconciling information is completely manual.	The lead time of the current reconciliation process is 13.4 sec. per employee. Average population is of 600 employees per Non QMS document with MES Configuration.	Yes

Improve

In this section, we describe the development and structured implementation of the Training Attendance Verification Automation (TAVA) tool. The initiative aimed to address inefficiencies and inaccuracies in training attendance tracking and reconciliation by introducing a standardized, automated solution. The implementation plan for TAVA was based on clear countermeasures validated through experiments and simulations. As shown in Table 5, the integration of TAVA successfully introduced control mechanisms to prevent unauthorized personnel from participating in training, which was validated through simulated scenarios. Additionally, the use of scanners within the TAVA system reduced the signature time to 3 seconds per person and enabled automatic reconciliation of attendance data—both of which met the desired targets.

To ensure a successful and sustainable rollout, a detailed implementation plan was executed, as outlined in Table 6. Key milestones included SIOQ and SIOR reviews, assignment of RCH and item numbers, system execution, and acquisition of scanning hardware for the Junco site. Moreover, procedural updates were made to embed TAVA into standard work, specifically by updating MPR_QSM_WI_009105 to include TAVA-related instructions. These tasks, owned and executed by Christian Vázquez and Nicole De Jesús, were completed within the expected timelines. The structured and validated implementation plan ensured that TAVA was not only deployed effectively but also integrated into existing operational systems to support long-term compliance and efficiency.

Table 5
Improvements

Counter measures	Experiment	Results
Implementation of TAVA application for training sessions.	Implementation of TAVA counts with controls to eliminate the possibility of giving training to non-required personnel. Validation process simulated this event.	Yes
Implementation of TAVA application for training sessions (scanners)	Simulation was executed during validation period that stipulates that new time to sign is 3 seconds and reconciliation of information will be automatic.	Yes

Table 6

Implementation Plan for TAVA

Task	Owner	Expected Date	Status
SIOQ Review	Christian Vázquez	20AUG24	Completed
RCH and Item number assignment	Christian Vázquez	20AUG24	Completed
Execution	Nicole De Jesús	30AUG24	Completed
SIOR	Christian Vázquez	03SEP24	Completed
Scanner acquisition for Juneo's site	Nicole De Jesús	29AUG24	Completed
Update MPR_QSM_WI_009105 to include TAVA instructions	Nicole De Jesús	20JAN25	Completed

Standard Work

Standard work is a key element of Lean methodology that establishes the most efficient and consistent method for performing a task. It ensures that processes are carried out in a repeatable and reliable manner, reducing variation, improving quality, and enhancing productivity. By documenting best practices, standard work enables employees to follow uniform procedures, facilitates training, and serves as a foundation for continuous improvement. In alignment with this principle, the TAVA system has been formally integrated into existing operational workflows through the update of the procedural document MPR_QSM_WI_009105 – Training Process (Figure 6). This update includes the newly established TAVA instructions to ensure that all relevant stakeholders follow the same standardized method for training attendance verification. In addition, a new document titled D00919191 – TAVA: Training Attendance Verification Automation Syllabus (Figure 5) has been created and will be assigned to all change owners and originators within the Medtronic Agile Program (MAP). This syllabus outlines the proper usage, objectives, and expectations of the TAVA tool, reinforcing process ownership and compliance. These standard work artifacts not only support the sustainability of the TAVA implementation but also provide a clear framework for onboarding, accountability, and ongoing operational excellence.

Figure 5

Procedure Document D00919191 TAVA - Training Attendance Verification Automation Syllabus


Training Process — Work Instruction

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Step	Role	Action
2.	LMS Admin, Creator Change Originator/Approvers, Change Analyst or Designee	• For **Product Change Order (PCH)** Workflow training determination need to be documented as per D00009655 and MPR_QSM_WI_009105. - The LMS Admin will evaluate and confirm the training plan in Collaborate step. - Corresponding LMS Transactions to be performed in **Pre-Release step** - For Juncos and Humacao the Change Originator or designee will train all affected personnel and document it in TAVA – Training Attendance Verification Automation System. If TAVA is not available proceed to generate the Training Completion Record - D00479919 to document training delivered. Refer to D00919191 - TAVA - Training Attendance Verification Automation Syllabus. - Prior Pre-Release step training signature, LMS Admin or Manufacturing Training Staff representative must verified documents configured with MES Dispatch (MES and CSOD synchronization are completed). LMS Admin or Manufacturing Training Staff representative ensure that only trained personnel can execute their task, and that access has been limited, if apply. - Non QMS Documents without MES Dispatch configurations, 95% of training completion of identified target audience is required to approve change order. ▪ Critical/Urgent changes without less of 95% training completion can be evaluated by LMS Admin or Manufacturing Training Staff representative and Change Originator to determine a mechanism to ensure training completion after effective date. - Supportive documentation and training evidence are properly uploaded by Change Analyst in Pre-Release step (if necessary), is clear and documented in the product change order. - After training and LMS implementation activities are complete, the PCH Owner will provide the implementation date in Pre-Release step.

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Figure 6

Procedure Document MPR_QSM_WI_009105 Training Process

Control

In this section, we explain the development and control strategy for the Training Attendance Verification Automation (TAVA) tool.

Figure 7

Times Studies Before and After the Implementation of TAVA

Figure 7 presents a comparative analysis of a process conducted before and after the implementation of TAVA and a scanner system. On

the left, the “Before” section (No TAVA) shows that the average time to complete training attendance was 14–16 seconds per person, totaling 8640 seconds (144 minutes) for 600 people. The reconciliation process took an average of 13.46 seconds per person, totaling 8076 seconds (134.6 minutes), significantly exceeding the set target of 3 seconds. On the right, the “After” section (With TAVA & scanner) demonstrates a dramatic improvement: training attendance time dropped to an average of 3 seconds per person (1800 seconds or 30 minutes total), and the reconciliation time was reduced to just 0.1 seconds per person (60 seconds or 1 minute total), far surpassing the original target. The results clearly indicate that the TAVA system and scanner significantly enhanced process efficiency, reduced processing times, and ensured consistent compliance with performance targets.

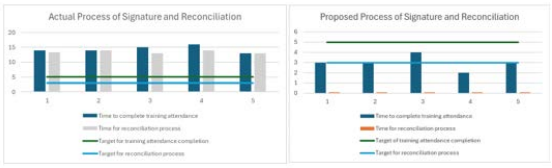

Figure 8
Improvements in Meeting Process Targets

Figure 8 illustrates the transformation of the signature and reconciliation process before and after the implementation of the TAVA system, emphasizing the improvement in meeting process targets.

The first chart, titled “Actual Process of Signature and Reconciliation,” represents the pre-TAVA state. Each sample (1 to 5) shows the time to complete training attendance and the time for the reconciliation process, both of which consistently exceed their respective targets. The dark blue bars (training attendance) range from 13 to 16 seconds, while the gray bars (reconciliation) hover around 13 to 14 seconds. These values are significantly above the green and blue lines, which represent the targets: 5 seconds for training attendance and 3 seconds for reconciliation. This indicates a process that is inefficient and unable to meet performance standards.

In contrast, the second chart, “Proposed Process of Signature and Reconciliation,” showcases the performance after TAVA implementation. Here, the training attendance times (dark blue bars labeled “time to complete training attendance”) are reduced to between 2 and 4 seconds, consistently staying below the 5-second target line. Even more striking is the reconciliation process (light gray bars labeled “Reconciliation time”), which shows a nearly flat line at 0.1 seconds, well below the 3-second target. This visual data clearly confirms the significant improvement in both processes, highlighting the effectiveness of TAVA in achieving and sustaining performance targets. This successful transition from the “Actual” to the “Proposed” process aligns with the Control Phase of the DMAIC cycle, which focuses on maintaining these gains through monitoring, standardized procedures, and continuous evaluation.

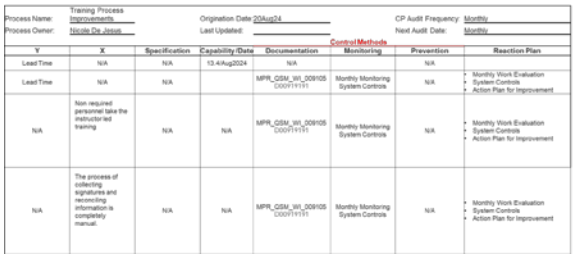

Figure 9
Control Methods to Monitor TAVA

CONCLUSION

This section summarizes the benefits of designing and implementing the Training Attendance Verification Automation (TAVA) tool using the DMAIC methodology within the operations framework. The tool delivered immediate and impactful improvements to the training attendance and reconciliation process. The benefits of the TAVA implementation are summarized as follows:

- The TAVA system significantly reduced the time required for training attendance and reconciliation, bringing both processes well below their target thresholds.

- It standardized the data collection process through structured Excel templates, ensuring consistency and accuracy across sessions.
- The system allowed real-time tracking and reconciliation, enhancing both transparency and reliability in data management.

We acknowledge that while TAVA is a custom-built automation solution tailored for a specific process, it does not replace broader HR or training systems. However, it greatly complements them by eliminating repetitive manual tasks, thus optimizing staff time and reducing the potential for human error. The Excel-based tracking approach enables alternate access to essential data even in environments where full enterprise platforms may not be immediately accessible.

Following its success, the TAVA system is currently under evaluation for deployment in other departments that require high-volume attendance tracking and reconciliation. This project not only fulfilled the operational efficiency goals but also highlighted opportunities for cross-functional collaboration and skill development in automation and process control. Moreover, it has helped identify potential leadership roles focused on sustaining and scaling process improvements within the Operations department, reinforcing a culture of continuous improvement aligned with DMAIC principles.

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