



Optimizing A Component Preparation's PTS Visualization Tools for Enhanced Manufacutring Performance

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Abstract

This project focuses on optimizing Performance-to-Standard (PTS) visualization tools by transitioning from spreadsheet-based dashboards to an integrated Power BI system. Traditional tools required manual data entry and lacked real-time integration, limiting operational visibility and the ability to identify process variability. The proposed solution integrates multiple data sources to provide real-time monitoring of key performance indicators such as Cycle Time Performance (CTP) and Pass/Failed Cycles. The system enhances visualization capabilities and supports data-driven decision-making. Results demonstrate improved visibility, effective monitoring of variability, and strong stakeholder acceptance. The solution establishes a scalable framework for continuous improvement in manufacturing environments.

Introduction

Manufacturing environments require real-time access to operational data to maintain efficiency and product quality. Traditional spreadsheet-based dashboards limit visibility and delay decision-making. This project develops an integrated dashboard system to improve monitoring of performance and variability.

Background

Data visualization and real-time monitoring are critical for modern manufacturing systems. The integration of Statistical Process Control (SPC) and Lean Six Sigma methodologies supports improved process control and variability reduction. Advanced dashboards enable faster identification of performance deviations.

Problem

- Manual data entry and consolidation
- Lack of real-time data integration
- Limited visualization capabilities
- Difficulty identifying process variability

Methodology

The project follows a **DMAIC** approach:

Define – Identify monitoring limitations

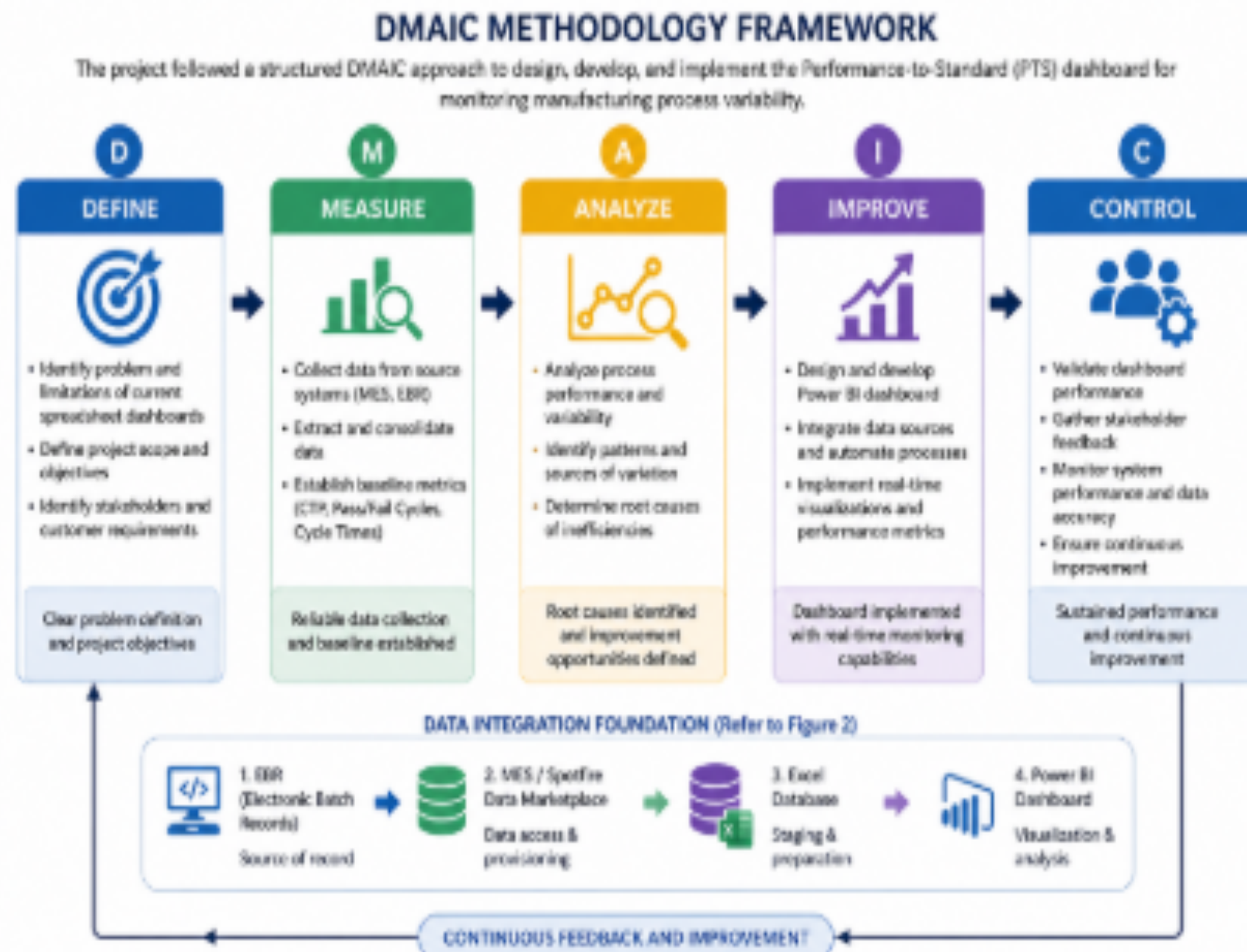
Measure – Collect operational data

Analyze – Identify variability and inefficiencies

Improve – Develop Power BI dashboard

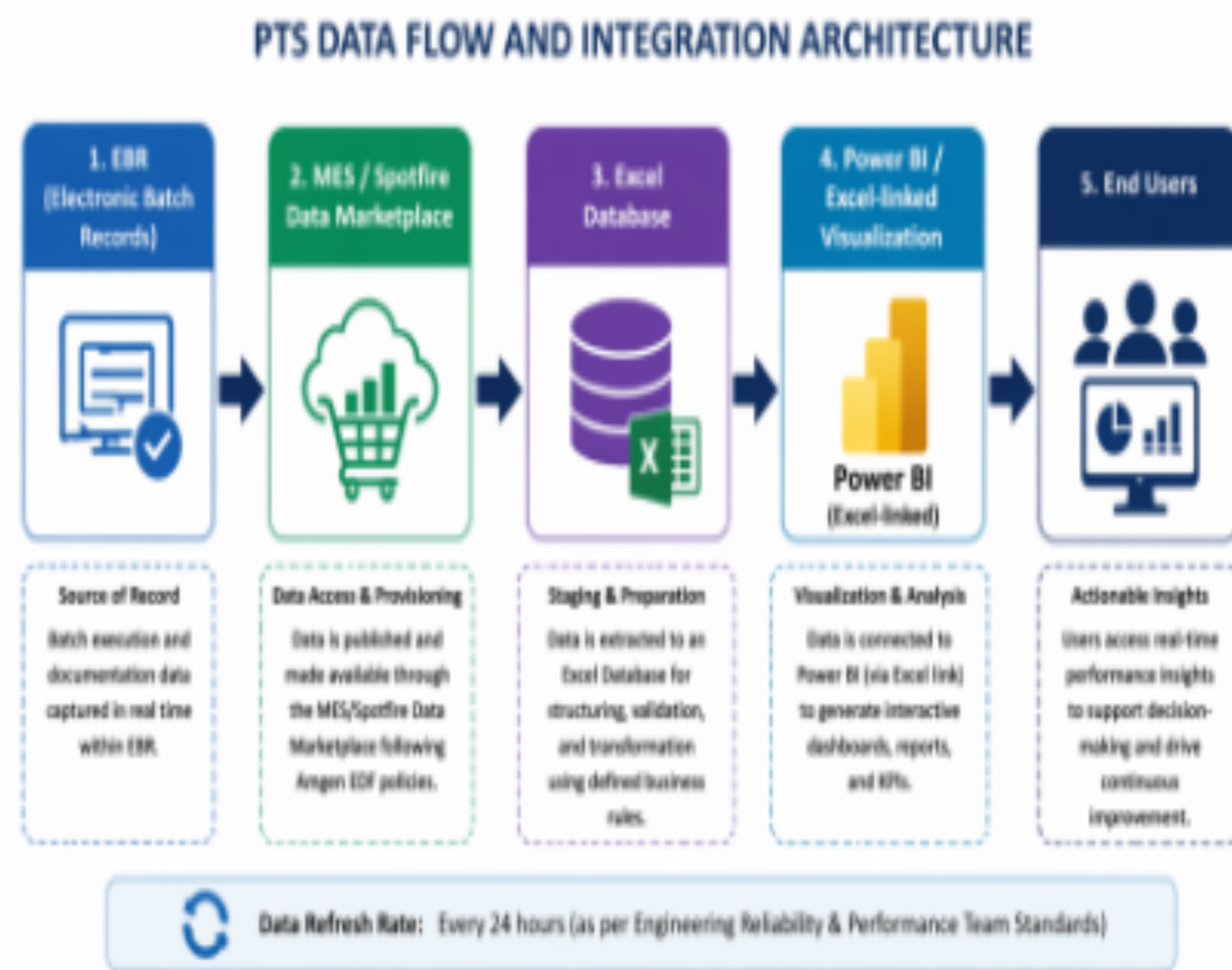
Control – Validate through stakeholder feedback

Methodology (cont'd)



SYSTEM / DATA FLOW

Operational data is integrated from multiple systems into Power BI for real-time visualization and analysis.



Results and Discussion

The dashboard provides real-time monitoring of cycle performance, capturing key metrics across equipment and process steps. It highlights trends and deviations from expected performance, allowing stakeholders to quickly identify areas requiring attention. By visualizing variability and pass/fail cycles, the system supports timely decision-making and continuous improvement initiatives.

Results and Discussion (cont'd)

Ultrasonic Operation Cycle Results									
Time Range		Equipment		Cycle		MO Number			
11/1/2025 to 12/4/2025		All		All		All			
Selected Cycle	Basic Operation Name	MO Number	MO Actual Start	Pre Cycle Time	Cycle Time	Post Cycle Time	Total Cycle Time	Delta	Cycle Result
Vial Filling Set	Ultrasonic Operation	14US041225_002	12/4/2025 12:23:12 AM	00:02:37	01:55:04	01:26:32	03:43:13	00:01:47	Pass
Vial Filling Set	Ultrasonic Operation	14US031125_008	11/9/2025 8:00:29 PM	00:06:08	01:58:42	00:17:38	02:22:28	12:22:32	Pass
Vial Filling Set	Ultrasonic Operation	14US031125_006	11/9/2025 11:23:30 AM	00:05:32	01:57:05	02:31:59	04:34:36	-0:09:36	Fail
Vial Filling Set	Ultrasonic Operation	14US031125_004	12/3/2025 9:00:32 AM	00:06:52	01:57:38	00:02:31	02:07:01	1:37:59	Pass
Vial Filling Set	Ultrasonic Operation	14US031125_002	12/3/2025 6:23:08 AM	00:15:31	02:01:34	00:11:42	02:28:47	1:16:13	Pass
Vial Filling Set	Ultrasonic Operation	14US021125_002	12/2/2025 8:15:58 PM	00:14:52	01:59:38	00:34:29	02:48:39	0:56:20	Pass
Vial Filling Set	Ultrasonic Operation	14US021125_002	12/2/2025 12:05:47 PM	00:06:38	01:56:36	00:06:31	02:07:45	1:37:15	Pass
Bicocart	Ultrasonic Operation	14US011125_008	12/1/2025 2:38:16 PM	00:10:54	01:58:53	00:08:13	02:14:00	1:31:00	Pass
Vial Filling Set	Ultrasonic Operation	14US011125_003	12/1/2025 6:23:14 AM	00:00:30	02:01:16	03:36:52	05:43:38	-1:58:38	Fail
Syringe Filling Set	Ultrasonic Operation	14US301125_006	11/30/2025 4:25:17 PM	00:07:08	01:59:58	00:38:19	02:45:25	0:59:35	Pass
Vial Filling Set	Ultrasonic Operation	14US301125_004	11/30/2025 11:22:49 AM	00:05:06	01:55:52	02:11:26	04:12:24	-2:27:23	Fail
Vial Filling Set	Ultrasonic Operation	14US301125_002	11/30/2025 6:47:59 AM	00:09:59	01:56:17	01:39:09	03:44:07	-0:04:06	Fail
Vial Filling Set	Ultrasonic Operation	14US291125_007	11/29/2025 10:38:54 PM	00:03:20	01:56:17	00:03:28	02:03:05	1:41:54	Pass
Vial Filling Set	Ultrasonic Operation	14US291125_005	11/29/2025 7:29:58 PM	00:07:31	02:02:21	00:33:24	02:43:16	1:01:43	Pass
Vial Filling Set	Ultrasonic Operation	14US291125_002	11/29/2025 7:31:00 AM	00:04:43	02:01:59	00:34:15	02:40:57	1:04:03	Pass
Bicocart	Ultrasonic Operation	14US261125_004	11/26/2025 6:08:53 PM	00:03:31	01:59:54	00:06:57	02:10:22	1:34:38	Pass
Vial Filling Set	Ultrasonic Operation	14US231125_002	11/23/2025 7:14:22 AM	00:07:30	02:09:34	00:19:52	02:36:56	1:08:04	Pass
Syringe Vacuum Parts L1	Ultrasonic Operation	14US211125_004	11/21/2025 2:25:39 PM	00:05:35	02:16:49	00:53:30	03:15:54	0:28:06	Pass

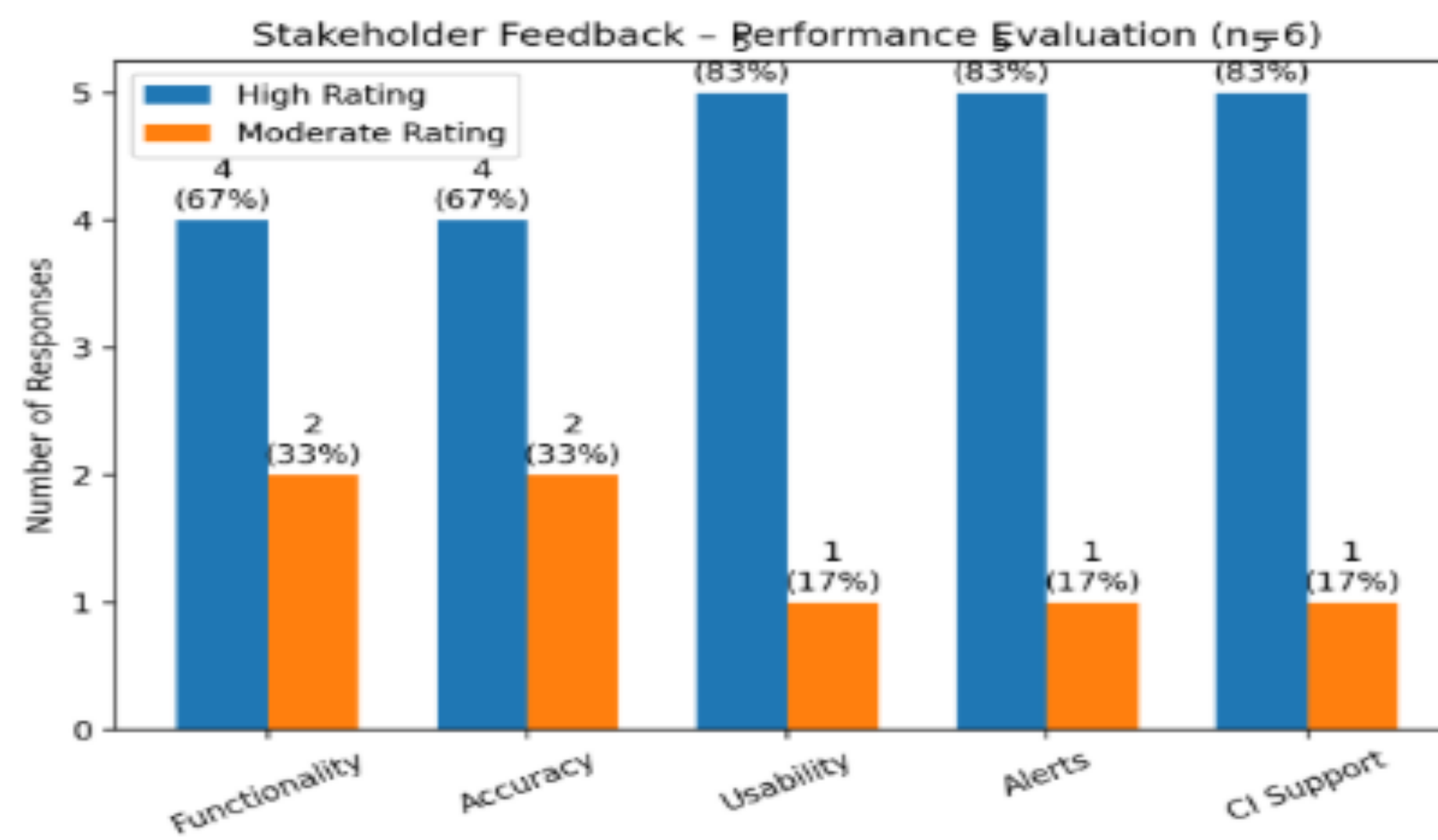
Variability Monitoring

The system enables identification of variability across equipment, loads, and processes, supporting proactive improvement efforts.



Stakeholder Feedback

- High usability and ease of interpretation
- Strong functionality and system acceptance
- Effective variability monitoring
- Supports continuous improvement



Results and Discussion (cont'd)

Statistical Analysis

Feedback from **6 stakeholders** showed that **83%** rated usability, alerts, and CI support highly, while **67%** rated data accuracy as very accurate. **Cycle Time Performance (CTP)** and **Pass/Failed cycles** were monitored across equipment and process steps, highlighting deviations from standard cycle times. Compared to Excel dashboards, the Power BI solution improved **monitoring efficiency and decision-making**, confirming its effectiveness as a **real-time performance tool**.

Conclusions

- Real-time dashboard improves operational visibility
- Enables monitoring of process variability
- Supports data-driven decision-making
- Replaces manual and delayed reporting systems

Future Work

- Advanced alert systems
- Increased refresh frequency
- Predictive analytics
- Expansion to additional processes
- Develop Remaining System Dashboards

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