THE DEVELOPMENT OF AN AUTOMATED MODULE PERFORMANCE TRACKER OUTPUT DASHBOARD

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ABSTRACT

Planning the production process is crucial for any industry. A production plan outlines how production will be carried out. An industry's management and manufacturing team must prepare and search for solutions for any production line downtime that may occur. The production team is capable of making contributions that go beyond simply spending hours moving data around. It might take a lot of time and effort to pull out a manual report, and disengaged workers can result in low production and high employee turnover. Developing an effective module performance tracker output data for an automated dashboard can save a lot of time and energy. This paper discusses and analyses the effectiveness of automating manual spreadsheet reports through a time study conducted at XYZ company. An automated dashboard not only saves 59.11% of time but also gives the management team visibility of all the important information.

1. Introduction

In an industry, production planning is crucial. The result of the production planning process is a production plan which outlines how production will be carried out. It outlines the equipment, raw materials, and labour resources that will be required as well as the production schedule that will be adhered to.

An industry's management and manufacturing team must prepare and hunt for solutions for any production line downtime that may occur. The potential contribution of employees goes beyond merely their time spent moving data around. It might take a lot of time and effort to pull out a manual report, and disengaged workers can result in low production and a high turnover rate.

Automating data collection allows producers to save time and acquire real-time insights into each stage of the production process. Undoubtedly, the main advantage of data monitoring is automated data collection.

Before the shift is over, the management group will be able to assess their performance in relation to the plan. This will increase team engagement and has the potential to fundamentally alter how the team runs the manufacturing operation (Dellner, W. J., 1981).

1.1 Problem Statement

Supervisors, managers, and directors have traditionally relied on paper reports and spreadsheets for information, which they then complemented with what the Manufacturing Execution System (MES) and Enterprise Resource Planning (ERP) systems can supply (Clough, 2012).

The prior shift or day provides management with metrics-related production data. The status of the machine and its performance against targets are examples of the type of data. The data is between 12 to 24 hours old at this time. Managers then compile this data into status reports for the board of directors. The focus is usually on performance against plans and direct expenses. The data could be days old by the time it reaches the director's desk (Bhojaraju, 2003).

This puts the manufacturing team at risk as they lack visibility on the production target vs actual output and are unable to keep track of timely WIP at the bottleneck processes. Furthermore, the future planning target is not revised timely for the planning team as the team publishes manual reports using excel files (Ming Jian, 2018).

By automating the manual spreadsheet data not only saves time but also gives the management team visibility on production's work in progress (Bibhudutta Jena, 2019).

1.2 Objectives

The objectives that are made to achieve the aim of this project are:

i. To develop an effective shifty module performance tracker output data for an automated dashboard
ii. To compare the effectiveness of the automated dashboard of an automated vs. manual report.

1.3 Scope

i. To understand Module Manufacturing flow
ii. To analyze capacity information of weekly demand, daily output, and utilization of equipment.

1.4 Project Outcome

i. To provide the management team with shift-by-shift visibility into the following Key Performance Index in order to respond quickly and recover any losses;
ii. Planned vs. actual production output.
iii. Monitoring the work in progress (WIP) at the bottleneck processes.
iv. To track the equipment utilization in the production line,
v. Time can be saved by automating the report or dashboard.

2. Methodology

Using corporate performance management or business intelligence solutions to automate report generation used to be a hassle. Despite the fact that the technologies were not tough, automation of dashboards required a lot of consultants. As a result, many companies still construct management dashboards using a manual process. The process often involves downloading data from the ERP system, altering the data, adding the data to Microsoft Excel, and copying and pasting the data into PowerPoint. The process is inefficient, prone to errors, and offers few drill-down possibilities (Bhojaraju, 2003).

Automating dashboards has never been simpler than it is now thanks to business intelligence (BI) technology. The effectiveness of tools like Tableau has been demonstrated, and they are simple to integrate with any enterprise planning system (ERP). A dashboard can be created using these cloud-based, plug-and-play BI tools and the appropriate data (Bibhudutta Jena, 2019).

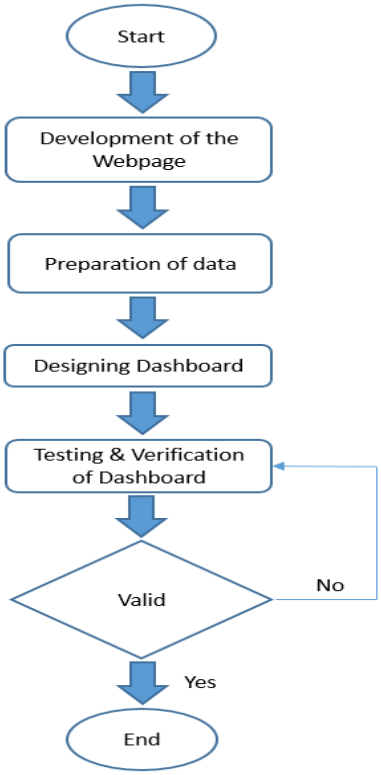

Figure 1. The process flow of developing a dashboard.

The first step, which is planning, will be done by team members who are responsible for producing the output measured, those affected by the output, and top management. Next, the web-page will be developed and designed by the system engineer. The information visualization and data requirements will be given by the planners and industrial engineers. All information gathered will have to go through the testing and verification process for future improvements. Once the information is stable, the dashboard will be completed. The steps to develop a dashboard through an online server are shown below (Bibhudutta Jena, 2019).

Step 1: Explore Projects
To get started, the user may sign into the Tableau site. Then, from the navigation pane, the user may explore to see all the content that the end user has access to across the site.

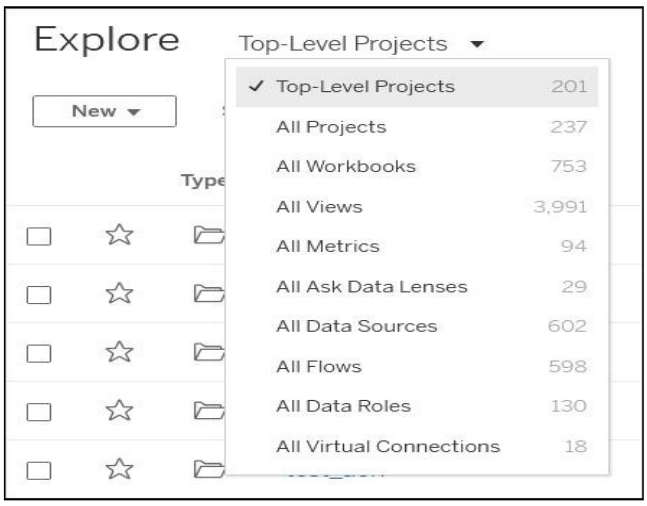

Figure 2. Explore the project webpage of Tableau

Projects are folders where workbooks, data sources, roles, and flows can be saved. Projects are a method of classifying and managing material on the site, similar to folders on a desktop.

Step 2: New workbook and Data Connection
Data needs to be connected in order to analyze it and build a workbook. Tableau allows the end user to connect data sources directly on the web.

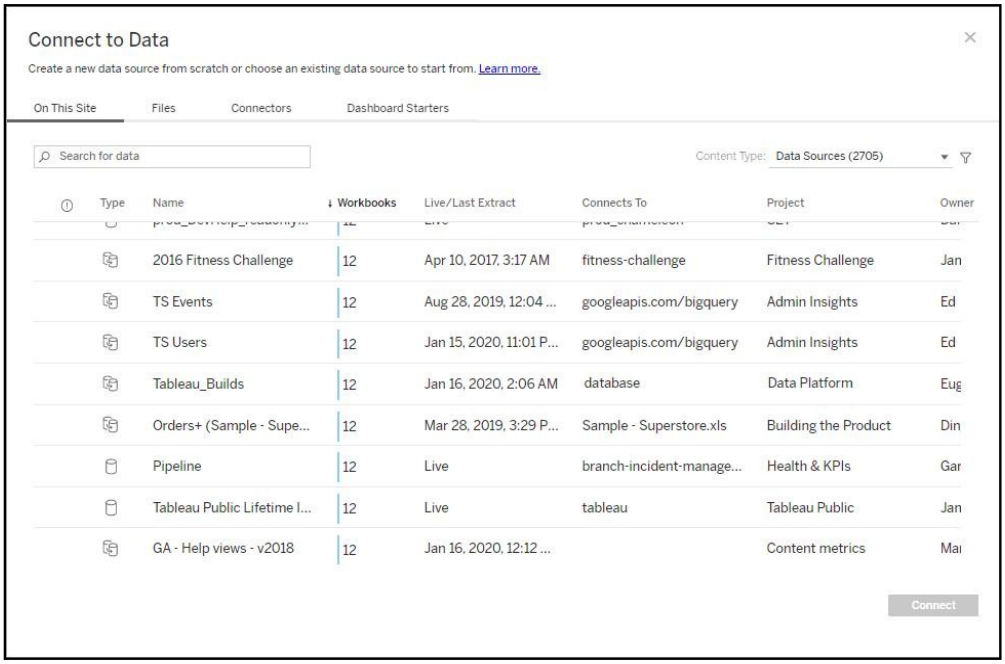

Figure 3. Connect to data web-page of tableau

Step 3: Prepare the data.
After data has been connected, the data will be used on the source page to prepare the data for analysis.

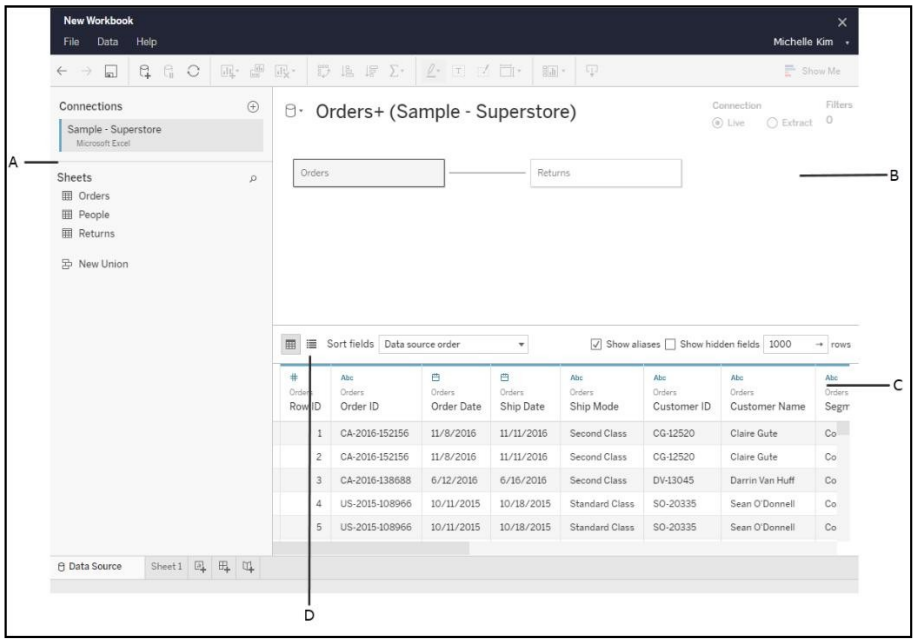

Figure 4. Parts of the data source page

Renaming the data source is one way of preparing data for analysis on the data source page, including using the Data Interpreter to clean up data and options for text files.

Step 4: Design a tableau.
The workspace layout for the dashboard is shown below.

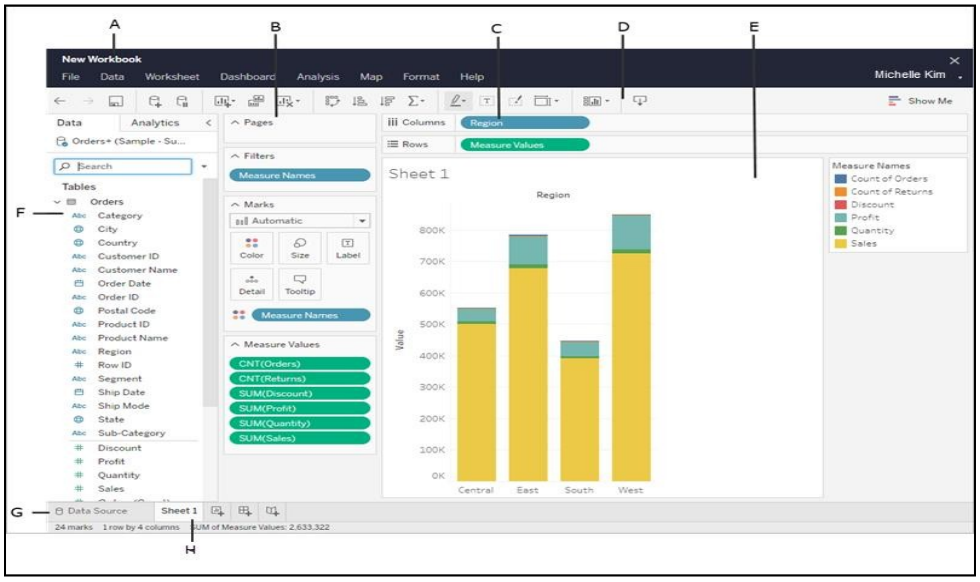

Figure 5. Layout of the dashboard workspace

Step 5: Publish Automated Dashboard.
All the parameters that are required in the module performance tracker will be fetched and automated directly from the production system into the dashboard.

WEEK 25															
		2/6/2022	3/6/2022		4/6/2022		5/6/2022		6/6/2022		7/6/2022		8/6/2022		
		Thursday	Friday		Saturday		Sunday		Monday		Tuesday		Wednesday		Thursday
Step Name		Night	Morning	Night	Morning	Night	Morning	Night	Morning	Night	Morning	Night	Morning	Night	Morning
FOL	Plan	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Delta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	WIP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	WIPx	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Utilization	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TEST A	Plan	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Delta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	WIP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	WIPx	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Utilization	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TEST B	Plan	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Delta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	WIP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	WIPx	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Utilization	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PACK	Plan	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Actual	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Delta	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	WIP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	WIPx	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Utilization	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 6. The final product of the Automated Module performance tracker Dashboard

After developing the dashboard, a time study was carried out to investigate the effectiveness of automating reports. The data collected was done through a time study of fifteen weeks on each bottleneck process flow. The production line is divided into two shifts. The first shift will work the morning shift from 7 a.m. to 7 p.m., while the second shift will work the night shift from 7 p.m. to 7 a.m.

3. Results and analysis

The outcomes of the data collection will be presented in this section, along with a comparison of the manual and automated dashboards. A time study was done to compare the effectiveness of the automated dashboard. The data was gathered over the course of fifteen weeks for each bottleneck process flow. The planners must submit various spreadsheets on output, tool use, work in progress (WIP), and sustainability during each shift. To meet the daily production needs, each shift must meet their daily target.

There are a few formulas applied when conducting the time study for the manual dashboard:

$$\textit{Max weekly boundary} = \textit{(Current Week Total Plan x Boundary Condition Util)/ Current Week Utilization \%} \quad (1)$$

$$\textit{Module WIPx} = \textit{WIP/ (Max Weekly Boundary)/7)} \quad (2)$$

$$\textit{Delta Sum Actual - Current WeekTotal Plan} \quad (3)$$

Table 1. Analysis of Time Study Manual Spreadsheet vs. Automated Dashboard

Week	Manual Report		Automated Dashboard		Reduction
	Min	(%)	Min	(%)	(%)
1	1071.02	80.34%	262.06	19.66%	60.68%
2	1042.81	79.44%	269.83	20.56%	58.88%
3	1042.09	78.12%	291.83	21.88%	56.24%
4	1069.52	78.43%	294.12	21.57%	56.86%
5	1057.51	80.11%	262.41	19.89%	60.22%
6	1058.82	79.85%	267.13	20.15%	59.70%
7	1112.01	80.45%	270.12	19.55%	60.90%
8	1086.28	78.92%	290.13	21.08%	57.84%
9	1110.74	79.13%	292.85	20.87%	58.26%
10	1082.73	79.57%	277.9	20.43%	59.14%
11	1137.26	79.69%	289.7	20.31%	59.38%
12	1119.68	80.17%	276.93	19.83%	60.34%
13	1154.08	79.95%	289.36	20.05%	59.90%
14	1117.93	79.91%	280.95	20.09%	59.82%
15	1106.26	79.84%	279.31	20.16%	59.68%
Mean	1091.24	79.59%	279.642	20.41%	59.18%

The data in Table 1 demonstrates the difference in average time consumption for publishing the production output between the manual and automated dashboards. It can be seen from the table that the manual procedure of posting the production output reports takes longer than the automated dashboard. In a week, the total time spent manually pulling reports and publishing them is around 1091.24 minutes, and this is just an average. If production receives more customer orders, there will be more reports and information to pull manually, delaying the publishing process.

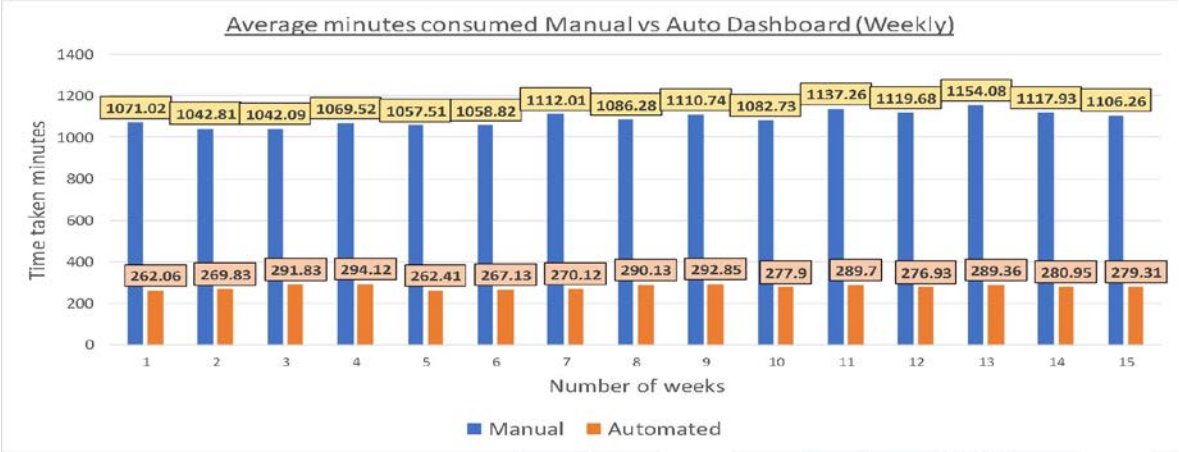

Figure 7. Average time consumption for Manual vs. Auto Dashboard (weekly)

Figure 7 above is a bar graph that depicts the weekly average time spent publishing the daily production output, both manually and automatically. The graph depicts a considerable change between the two dashboards over the course of fifteen weeks. It can be seen that human reports take an average of 1091.24 minutes per week, whereas the automated dashboard requires only 279.64 minutes per week. By automating the reports, users can save more than half the overall time. From this data analysis, it is clear that an automated dashboard takes less time than a human report.

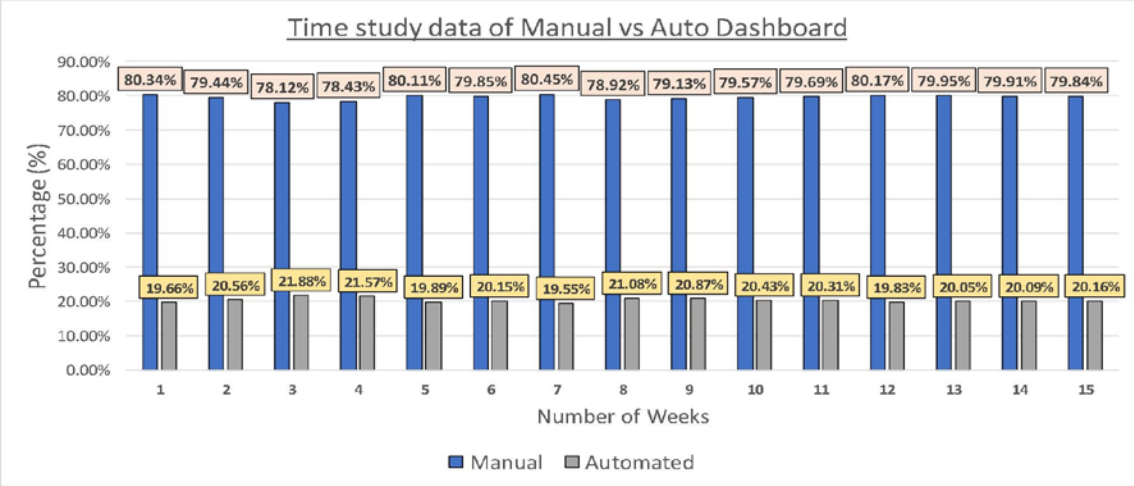

Figure 8. Average minutes of Manual vs. Auto Dashboard (weekly)

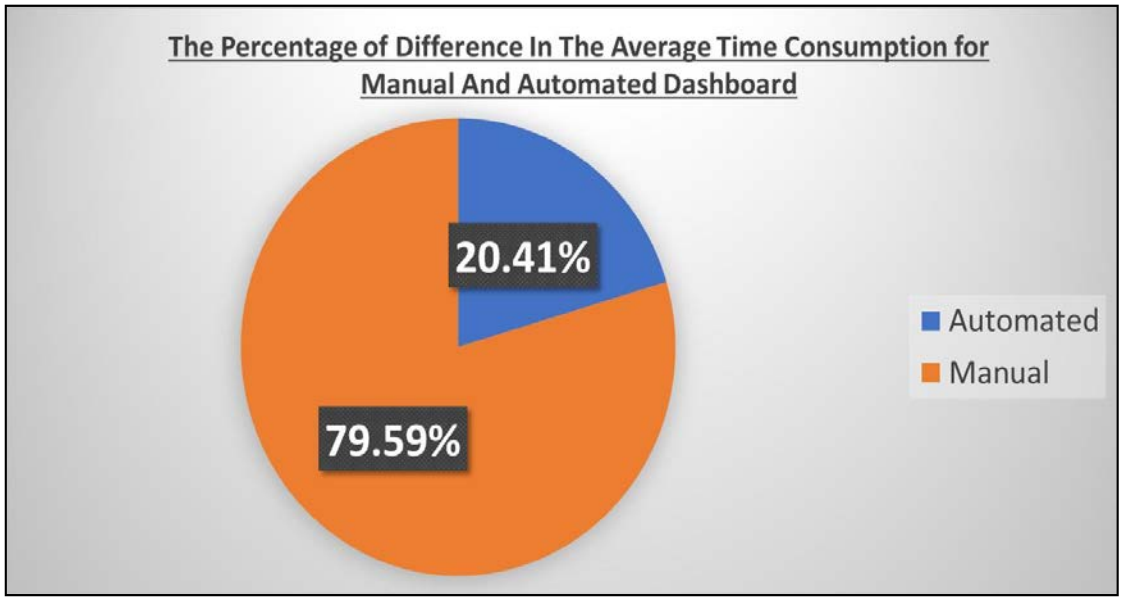

Figure 9. The Difference in time consumption for Manual and Automated Dashboard

Figure 9 above is a pie chart depicting the average weekly time spent on both the human and

automated processes of reporting daily manufacturing output. As can be seen in the chart, there are considerable variances between the two dashboards over the course of fifteen weeks. It can be noted that manual reports take an average of 79.59 percent of the time in a given project. This data analysis clearly demonstrates the first and primary goals of this study, which are to present an effective automated module performance tracker daily and to save time consumption by designing an automated daily performance for the management team's usage.

4. Conclusion

This paper discusses and analyses the effectiveness of automating manual spreadsheets through a time study. This project comprises a continuous procedure from planning how to carry out the project to presenting it to industrial supervisors and academics. The purpose of this research was to identify the effectiveness of a daily automated production output dashboard. Based on the analysis conveyed, both objectives have been achieved as it can be concluded that developing an automated daily output dashboard has saved an average time of 811.6 minutes and 59.11% in percentage in a week. In an industry, the management and the manufacturing team must plan for and find solutions for any production line downtime. Shift planners can contribute more than just hours transmitting data from one location to another. Manual report fetching can take a lot of time and effort, and disengaged personnel can result in low productivity and high attrition. By using an automated dashboard, all the data that is currently being pulled manually can be auto generated, providing the same results in a much shorter amount of time. The industry will become more effective and productive if this time-consuming and repetitive process is reduced.

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