ELEVATING EFFICIENCY: KAKAROT SUPER GUI'S JOURNEY TOWARDS ENHANCED PRODUCTIVITY

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ABSTRACT

A powerful and adaptable Graphical User Interface (GUI), the KAKAROT SUPER GUI is intended to increase efficiency and simplify system operations. This application makes a wide range of system commands and functions easily accessible, allowing users to complete difficult tasks with little difficulty. Because of its simple structure and straightforward design, it is an indispensable tool for anyone looking to streamline their productivity.

Production Stoppage Errors were found to be a major problem affecting productivity in the Probe Operations production area because of substantial downtimes. By lowering the time and effort needed to complete routine tasks, the KAKAROT SUPER GUI solves this problem and lessens the negative effects of production stoppage errors on output.

This program promises a large increase in productivity for its users, and it's more than just a fix—it's an efficiency revolution.

1. 0 INTRODUCTION

Probe Operations is a fast-paced field where productivity and efficiency are critical. But in 2023, the authors discovered a major obstacle affecting productivity: production stoppage errors. High downtimes brought on by these mistakes were slowing down operations and lowering overall output.

In order to address this specific issue, this work introduces the KAKAROT SUPER AI, a potent and flexible graphical user interface (GUI). The KAKAROT SUPER AI seeks to minimize the time and effort needed to complete normal tasks by optimizing system operations and providing easy access to a broad variety of system instructions and functions. Thus, the effect of production stoppage errors on output is lessened.

Although the KAKAROT SUPER AI has shown encouraging results, it's crucial to understand the tool's limitations. It might not have the same effect in other situations or with different kinds of jobs because its purpose is to increase efficiency within the context of probe operations. Moreover, even though it considerably lessens their effects, production stoppage faults are still there.

This study will examine the inner workings of the KAKAROT SUPER GUI and how it improves productivity by addressing the issue of production stoppage errors. We'll also examine relevant research in this area, evaluating and comparing various strategies for resolving productivity problems in probe operations.

1.1 Production Errors Impact

In 2023, 50% of the total downtime Experienced by our Tester Equipment Engineering are Production Stoppage issues coming from Manufacturing escalations. This includes hang ups, fatal errors, automation errors, system bugs, network issues and application issues. Figure 1 below shows the pie chart distribution of downtime.

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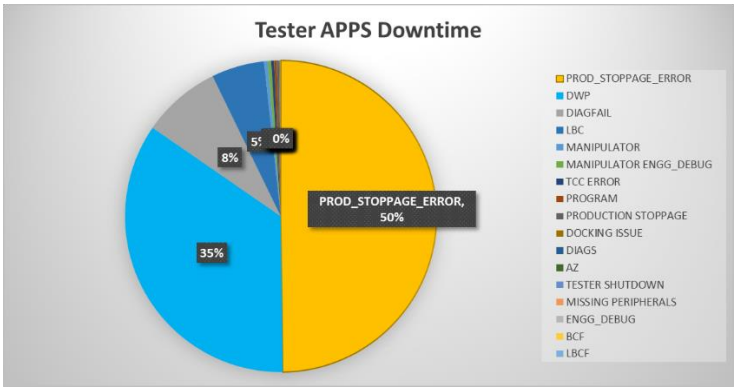

Fig1. Tester Applications Engineering Downtime

1.1.1 PROBE Tester Downtime Pareto

These errors result in a downtime duration of 4 to 6 hours, worst case scenario will be down for 12 hours due to waiting for engineering support incase support is not around to fix it.

This translates into an Overall Equipment Utilization (OEU) loss of approximately 1%. Figure 2 shows the pareto of downtime using the 80-20 rule of impact. As seen on the pareto, production stoppages due to these errors leads to a cumulative impact of 49.8% over the year.

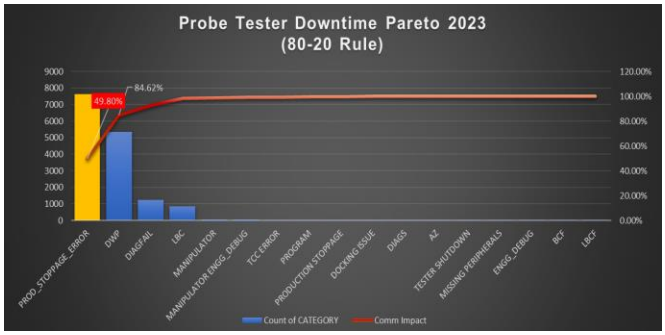

Fig 2. Tester Downtime Pareto (2023)

It was also evident the increasing number of production stoppage errors noting from January 2023 to March 2023 in Figure 3 which is equivalent to 63% increase.

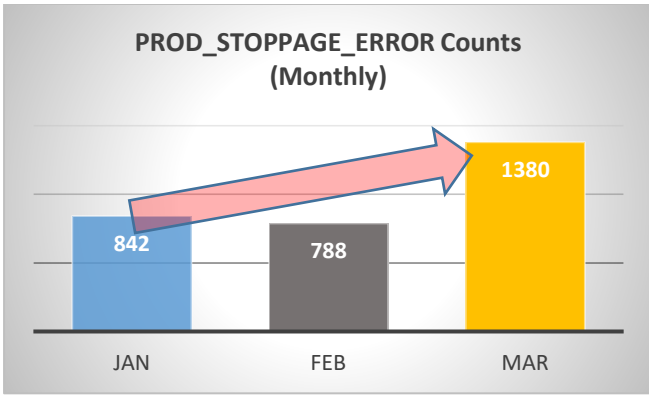

Fig3. 2023 Production Stoppage Frequency Monthly

This now leads to increasing Overall Equipment Utilization loss due to this downtime from January to March of 2023 which is equivalent to 81% increase. Refer to Figure 4 for the trend.

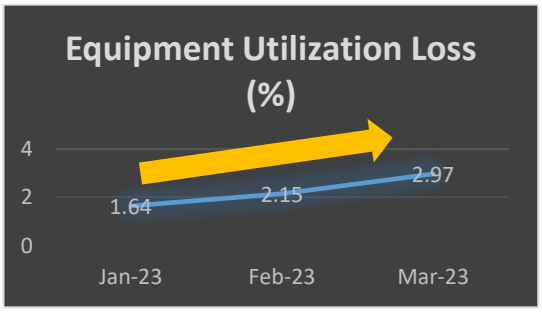

Fig 4. Equipment Utilization Loss Monthly Trend.

2. 0 REVIEW OF RELATED WORK

"Not Applicable.".

3.0 METHODOLOGY

Utilizing the Fishbone Methodology, the authors enumerated every potential cause for production stoppages. Please refer to Figure 5 below.

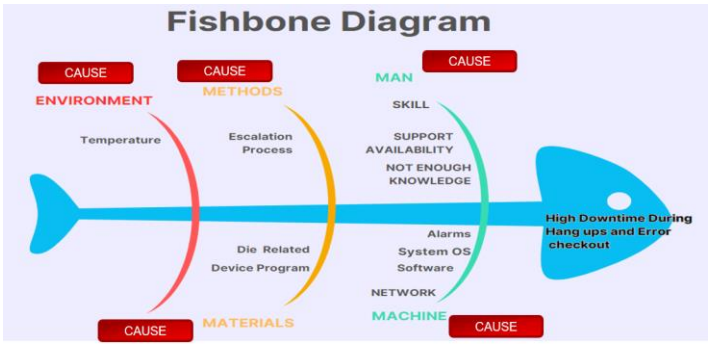

Fig 5. Fishbone Diagram

Seeing that there could be more than one rationality, the authors chose to focus on Method and Man in order to solve the issue and find a solution.

As illustrated in Figure 6, the authors further examine the root causes of the issue using the Fault Tree Analysis.

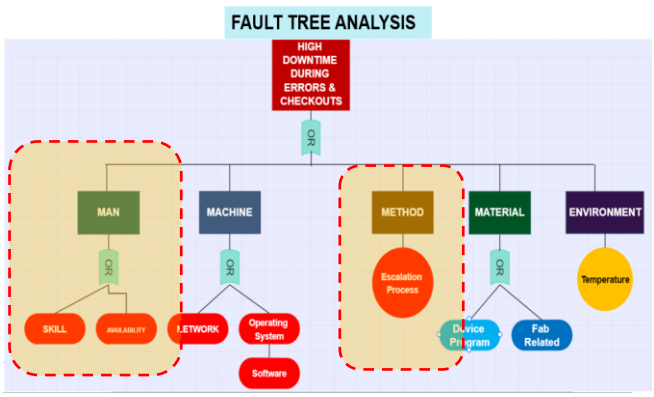

Fig 6. Fault Tree Analysis.

The authors narrowed down the root cause using Why-Why analysis for MAN and METHOD categories. Refer to Figures 7 and Figure 8.

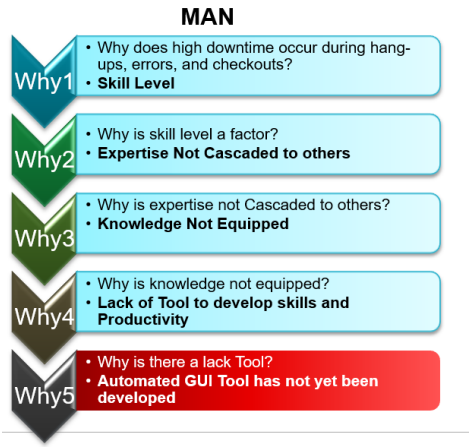

Fig 7. MAN Why-Why Analysis

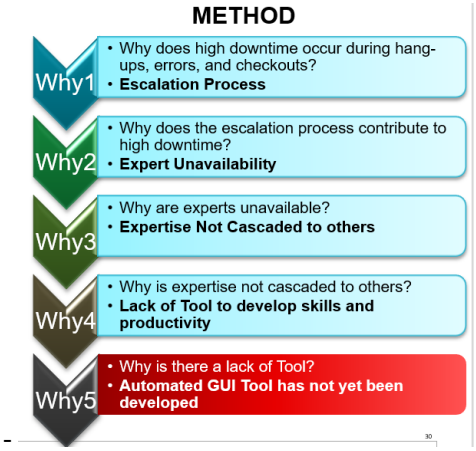

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Fig. 8- METHOD- Why-Why Analysis

Following completion of all Root Cause Analysis techniques, the authors made the decision to develop an AI (Artificial Intelligence) tool using Perl scripting that improves Engineering Supports' productivity, efficiency, and skill set. The tool takes the shape of a Graphical User Interface. This Graphical User Interface (GUI) tool is supposed to be able to solve problems with a single button click. This application, named KAKAROT The Super GUI, is made up of multiple Shell scripts with various essential features to fix specific kinds of problems, which are then shown on a Graphical User Interface through the use of Perl programming. The GUI tool's block diagram composition is depicted in Figure 9.

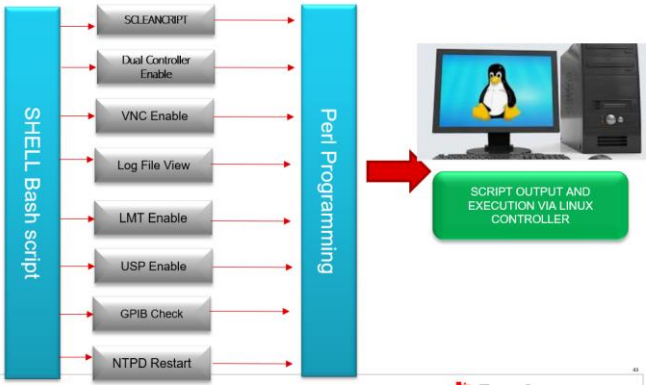

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Fig 9- KAKAROT Block Diagram

Refer to Figure 10 for the actual GUI view.

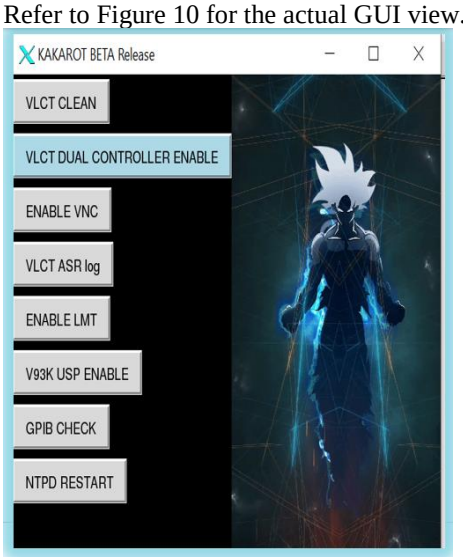

Fig 10- KAKAROT GUI View

4.0 RESULTS AND DISCUSSION

4.1.Manual Execution versus KAKAROT

In order to evaluate downtime between utilizing KAKAROT's AI capabilities and the manual solution of running the script, the authors ran a time study. Providing an overview by comparing tasks and problems completed in a table. The fact that Kakarot can resolve a problem with a single click is remarkable. For a comparison of the data, see table 1.

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PROBLEM	OLD PRACTICE	DOWNTIME OLD PRACTICE (HRS)	USING KAKAROT	DOWNTIME (KAKAROT)
Cannot load program on VLCT	1. Log in to event manager 2. Email APPS to check 3. APPS to check the issue 4. APPS will either manually kill via manual typing the script or reboot and reload the controller	3-4 hrs (ave)	1.Open KAKAROT and Click VLCT CLEAN BUTTON 2. Reload back to Prod	10-15 minutes
Cannot enable Dual Controller in VLCT	1. Log in to event manager 2. Email APPS to check 3. APPS to check the issue 4. APPS will either manually enable by manual typing the script or reboot and reload the controller	3-4 hrs (ave)	1.Open KAKAROT and Click VLCT DUAL CONTROLLER ENABLE BUTTON 2. Reload back to Prod	10 minutes
Cannot Enable VNC	1. Log in to event manager 2. Email APPS to check 3. APPS to check the issue 4. APPS will either manually enable VNC by manual typing the script or reboot and reload the controller	1-2 Hrs	1.Open KAKAROT and Click ENABLE VNC BUTTON	1 click, less than 1 minute
Cannot enable LMT	1. Log in to event manager 2. Email APPS to check 3. APPS to check the issue 4. APPS will either manually enable LMT by manual typing the script or reboot and reload the controller	1-2 Hrs	1.Open KAKAROT and Click ENABLE LMT Button	5 -10 minutes
Cannot Load program on V93K, USP waiti	1. Log in to event manager 2. Email APPS to check 3. APPS to check the issue 4. APPS will either manually enable USP by manual typing the script or reboot and reload the controller	12 Hours, very few people knows V93	Open KAKAROT and click V93K USP Enable Reload back to Production	30 minutes
TSK ERRORS	1. Log in to event manager 2. Email APPS to check 3. APPS to check the issue 4. APPS to check GPIB functionality by manually typing the script, Checks cable and GPIB driver	1-2 Hrs	Open KAKAROT and click GPIB check Button	30 minutes
NTPD ERROR During lot loading	1. Log in to event manager 2. Email APPS to check 3. APPS to check the issue 4. APPS to check manually type script, reboot controller and reload	1-2 Hrs	Open KAKAROT and Click NTPD Restart Button	30 minutes

Table 1- Task Downtime Comparison

Summarizing the findings in Table 2, KAKAROT clearly outperforms manual methods in reducing downtime, improving efficiency, and enhancing user convenience. What used to take 12 hours can now be resolved with just one click. The process has been simplified from four steps to one, and expertise is no longer necessary as the tool replicates expert skills.

CATEGORY	OLD PRACTICE	KAKAROT
DOWNTIME	12 Hrs (Max)	1 minute (1 click)
ESCALATION PROCESS	4 steps	1-2 steps
Needing Expert?	YES	NO (Anyone can do it)

Table2- Old Practice (Manual) vs Kakarot Comparison

4.2 Process Improvement Comparison

The authors carried out a comparison study of process improvements between the manual method and the KAKAROT tool using process mapping. For a visual representation of the process comparison, refer to Figure 11. It can be seen that process has been simplified using KAKAROT Tool because skill and expertise has now been replicated to all users.

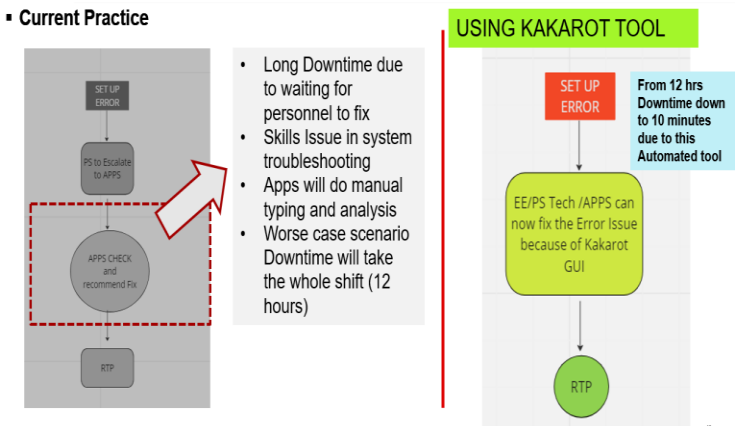

Fig 11- Process Comparison Current Process vs Kakarot Tool.

4.3 Production Errors Escalated Counts reduction

Since its implementation in June 2023, the tool has yielded remarkable results, with an impressive 80% reduction observed in escalated issues related to production stoppages and hang-ups. For further details, please consult Figure 12 for reference.

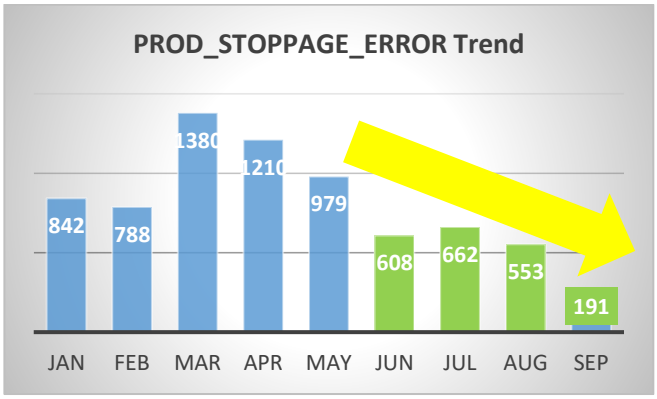

Fig 12- Escalated Count errors Monthly.

4.4 Equipment Utilization Loss Improvement

Since the project's initiation, there has been a noticeable improvement, with a significant 48% drop in equipment utilization loss due to hang-ups. For further details, please refer to Figure 12.

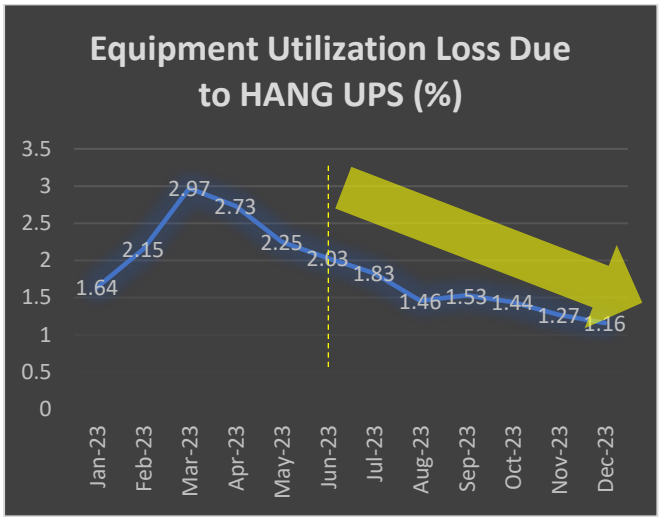

Fig 12- Utilization Loss Due to Hangup Monthly Trend.

4.5 Impact on Wafer Outs and Testware Hours

Positive impact also felt on Wafer outs count by 11% and Testware hour by 24% improvements respectively. Refer to Figure 13 for the trend improvements.

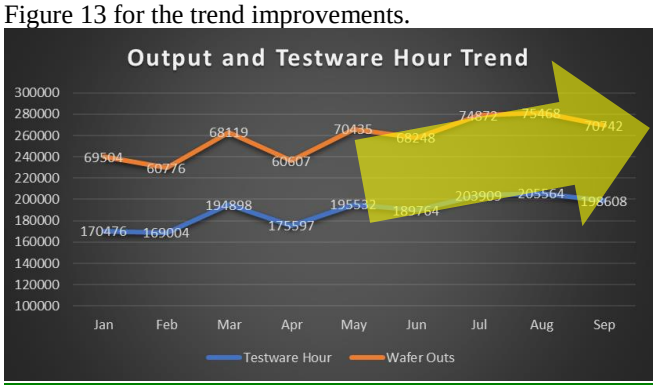

Fig13- Wafer Outs vs Testware Hour Monthly Trend.

4.7 Best Practice Sharing

As a result of its effective and powerful utilization, this project has been shared using the Best Practice Sharing (BPS) Methodology, designated with the BPS number **BP-20230628-4990.**

5.0 CONCLUSION

The authors concluded that, as compared to manual execution, the use of KAKAROT Super GUI (Graphical User Interface) produced notable gains in a number of operational areas. A comparative time analysis demonstrated that KAKAROT significantly decreased downtime, improved productivity, and offered unmatched convenience. The tool's efficiency in streamlining procedures, cutting steps, and doing away with the need for specialist knowledge was proved by its capacity to resolve problems with a single click. Additionally, process mapping demonstrated distinct improvements made possible by KAKAROT, demonstrating its supremacy in workflow management optimization.
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6.0 RECOMMENDATIONS

Given the noted advantages and benefits, it is strongly recommended to further integrate and extend the application of KAKAROT Super GUI across relevant operational areas and domains. This expansion is crucial for maximizing its impact on overall productivity and efficiency. Moreover, ongoing monitoring and evaluation are essential to identify additional opportunities for improvement and ensure the sustained effectiveness of the tool. Additionally, fostering a culture of innovation and efficiency within the organization can be achieved through the dissemination of knowledge and wider adoption of best practices, facilitated by methodologies such as BPS (Best Practice Sharing). Furthermore, to enhance production, it is advisable to replicate the success of this tool by implementing it in other Texas Instruments sites and encouraging its adoption by businesses worldwide.

7.0 ACKNOWLEDGMENT

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Bien Daryl Garcia (Probe Operations Director) for the technical drive and guidance.

8.0 REFERENCES

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2. "Programming Perl" in Best Books To Learn Perl Programming in 2024, ComputingForGeeks[3].

3. "Perl Tutorial: Basics to Advanced" by VLSI Academy[6].

4. "The Linux Cast" - An impressive channel by Matthew Weber, a fellow content creator who uses Linux in his daily life[2].

5. "The Linux Experiment" - One of the most popular YouTube channels for Linux users, with Nick as the host[2].

9.0 ABOUT THE AUTHORS

Bonnierick J. Mendoza is an Electronics Engineering graduate from Saint Louis University Baguio. He began his career at Texas Instruments Philippines Baguio in 2008 as an Apprentice. Currently at Texas Instruments Clark, he serves as a Production Test Applications Engineer and Equipment Engineer for Probe Operations. His expertise lies in debugging complex device programs and hardware issues, recommending enhancements to device programming methods, and developing diagnostics for testers. Bonnierick excels in hardware and software issue resolution, isolation process improvement, and automation tool creation to boost engineering productivity.

Jeric C. Del Rosario is a Computer Technology graduate from Clark College Science and Technology . He began his career at Texas Instruments Clark in 2011 as an Apprentice. Currently at Texas Instruments Clark, he serves as a Test Applications Technician and Equipment Technician for Probe Operations. His expertise lies in Tester and Prober hardware issues, Isolation hard down and enhance Breakthrough solutions to Tester, and developing diagnostics for testers. Jeric excels in hardware issue resolution.

10.0 APPENDIX

Not Applicable