Implementation of RoboEOC (Automated Incident Management System) to Human Centric Incident Ticketing Management Workflow

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Abstract

By reducing Mean Time to Recovery (MTTR) companies can minimize the duration of system outages and restore services promptly, thereby reducing the impact on the business. Typically, in a Contact Centers or IT Service Desk environment, once the ticket has been tagged in critical status, a serious issue is identified and defined as a problem (e.g., bug or incident, not an enhancement request), this could impact a client or trial's workflow to the point where existing or new revenue is at risk. This research conducted a case study of an actual IT service desk company based in Manila, Philippines on how they handled "Critical Tickets" due to system-wide outages or unexpected downtime of software products. The identified causes of High MTTR that were based on the data of Fiscal Year 2022 were the primary basis. The identified root cause is the following: (1) Not meeting the required Service Level Agreement (SLA) for a minimum Average Handling Time of 15 mins. (2) Promptness of the scheduled EOC in acknowledging and Responding to Emergency Critical System Alerts. (3) Availability of Dedicated Software Dev Engineers / Product Specialists from a different region to respond to Critical Paging Alert. Based on the identified causes, the study proposed two major solutions to address the uncontrolled MTTR in responding to Critical Tickets. First, the enhancement of the current Customer Relationship Management (CRM) User Interface (UI) by conducting usability testing based on the (ISO 9241-11) metrics. The SUM results of enhanced CRM UI give 6.97 higher compared to the existing CRM design. The Effectiveness improved for getting 100% quality, the Efficiency having 90.45% quality, and the User-Satisfaction garnering 90.67%. Second, is the implementation of RoboEOC for full automation of the paging alerts system replaces the EOC as the main personnel that responds to/acknowledges the ticket once it was tagged as critical. This brings a well-automated paging of the concerned team (On-Call Software Engineers / Product Specialists) based on the product that was used to file the ticket. RoboEOC also features "Squadcast-On call scheduling". This feature is a way to see who is in charge and when they oversee a specific critical ticket. A workflow Simulation using ARENA was also performed to test the newly proposed workflow if it will do a significant change in lowering the MTTR and handling time of Engineers/Specialists.

Keywords
Mean Time to Recovery (MTTR), Customer Relationship Management (CRM), Automated Incident Management System (AIMS), RoboEOC, Emergency on-call Engineers (EOC)

1. Introduction
Human-centric incident ticket management refers to the process of handling and resolving incidents reported by users or customers. It involves a systematic workflow to ensure that issues are addressed promptly and efficiently. Automating this workflow can bring several benefits and improve overall productivity. Switching the typical human-centric incident ticket management workflow to automation shall bring several advantages mainly in ticket assignment and escalation. Through automation, tickets are assigned to the appropriate individuals or teams responsible for

resolving the issues promptly. Moreover, automation can use predefined rules, workload balancing algorithms, or even intelligent routing based on skills and availability to assign tickets automatically. Additionally, when an issue requires escalation to higher-level support, automation can facilitate the process, ensuring prompt attention to critical incidents. In addition, throughout the incident resolution process, effective communication and collaboration among support teams and users are crucial. Automation can facilitate communication by sending automated notifications and updates to stakeholders, ensuring everyone is informed about the progress and status of the incident.

1.1 Case Study Overview (Company Pseudonym: Financial Data Inc. "FDI")

Once a ticket has been tagged critical an automated paging alert will be activated for the Emergency-on-call (EOC) Engineer to acknowledge. The EOC will be the main responsible for analyzing the documented information on the ticket and identifying the correct team that needs to be called out or paged for immediate resolution. EOC will attempt to manually page the scheduled on-call Product Specialist or Software engineer to join a discussion or call to troubleshoot internally the issue.

Table 1. Ticket Severity Guidelines

Ticket Severity	Definition	Comment
Critical	***A serious issue*** that is affecting a small number of clients and/or significant risk of ASV loss	Significant degradation of FDI platform reliability. Sustained situation materially impacting the use of FDI.
High	The request requires immediate attention, assuming no pressing Emergency or Critical Tickets	Greatly impacts the client's workflow and is a time-sensitive issue
Medium	A request is important but does not require an immediate response	This an important issue and should be resolved promptly
Low	A lower degree of importance will be queued for future response	Enhancement or question that does not need immediate attention

Once the on-call Engineers acknowledge the manual page, he/she or their team will need to conduct a high-level investigation and diagnosis of the issue. During the internal troubleshooting process, the EOC together with the on-call Engineers will collaborate for identifying the root cause of the system-wide issue and provide an ETA when the issue will expect to subside or provide a workaround that can be communicated to customers if the issue will take more time than usual to resolve. Once the critical tickets have been announced as controllable or fixed, the EOC needs to send notifications to all affected clients followed by the creation of a Postmortem report with the on-call Engineers who responded to the critical event before the ticket is officially declared close or resolved. The figure below shows the overall view of the Existing Ticket and Incident Management Process Workflow of FDI.

Table 2. Ticket Distribution (FY2022)

	Count	Remarks
General Support Ticket	1312	13% of the Overall Ticket Count
Tech Support Ticket	14268	87% of the Overall Ticket Count
Tier 1	11272	79% of Total Ticket from Tech Support
Tier 2	2176	15.25% of Total Tickets from Tech Support
Critical Tickets	220	1.75% of Total Tickets from Tech Support

In this study, further analysis in monitoring the critical incidents recorded from the critical tickets by the FDI Tech Support team will be the major key in identifying major causes and their impacts and contributing factors in the high Mean Time to Recovery (MTTR).

Table 4 shows the historical average number of Critical ticket escalations from the previous Fiscal Year 2022 which accumulated 1899.97 total minutes and is equivalent to 8.64 MTTR(FY). For the next coming months or at the beginning of the new Fiscal year the management would like to set a goal of having lower MTTR.

Table 3. Tech Support Products

Tech Support Products	Counts (FY2022)	Percentage
Installation	4857	43%
Connectivity	5212	46%
Office Integration	3598	32%
Class "A" tickets	601	5%

According to industry standards, the ideal MTTR should be less than five hours, and from the last Fiscal Quarters, the company doesn't have an existing KPI or target yet for MTTR per FQ/FY. Therefore, this study will aim to test if the industry standard of less than 5 overall MTTR will be attainable, and for the stakeholders to control and reduce the MTTR or mean time to recovery of FDI from the last Fiscal year of 8.64 MTTR(FY).

Table 4. Critical Escalation and MTTR (FY2022)

Total Critical						
FY2022		**by Month**	**by quarter**	**Critical in Hrs**	**MTTR**	**Total**
FY22-Q1	Jan	6	26	109.56	18.26	220
	Feb	10		129.4	12.94	
	Mar	10		144.98	14.50	
FY22-Q2	April	11	63	156.45	14.22	
	May	23		156.12	6.79	
	Jun	29		156.24	5.39	
FY22-Q3	Jul	28	72	119.67	4.27	
	Aug	24		189.78	7.91	
	Sep	20		166.89	8.34	
FY22-Q4	Oct	21	59	189.56	9.03	
	Nov	26		191.43	7.36	
	Dec	12		189.89	15.82	
		Critical in Hours		**1899.97**		
		Overall MTTR		**8.64**		

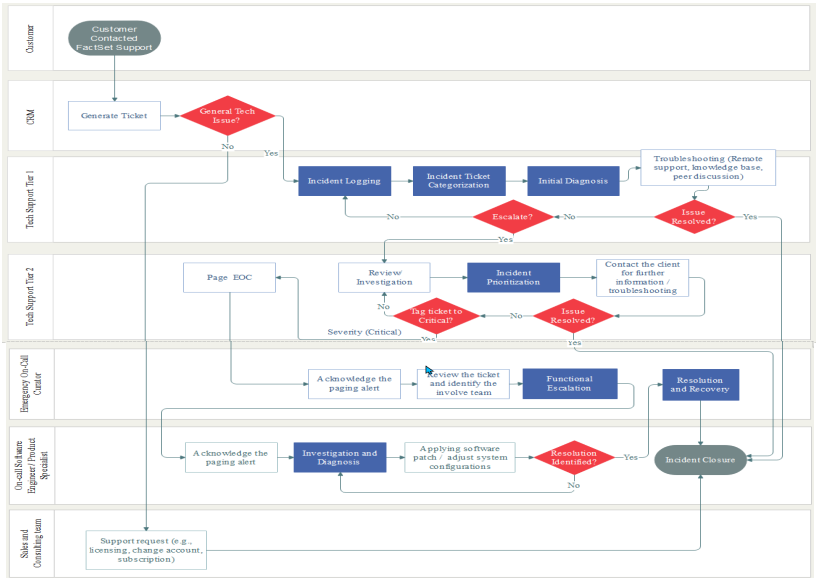

Figure 1. Existing Ticket and Incident Managocess Workflow

1.2 Objectives

This study aims to control and minimize the Mean Time to Recovery (MTTR) of Critical tagged tickets due to System-Wide Emergencies or unplanned outages of the company, FDI needs to meet the MTTR of 5 for the next Fiscal Year of 2023.

- To evaluate the current CRM UI usability considering the ISO 9241-11 Standard. Based on the results enhanced UI usability will be measured based on effectiveness, efficiency, and user-satisfactions.
- To design an "Automated Paging Alerts System" and replace the current "Human Centric Incident Management" System in responding to Critical tickets caused by unexpected downtimes or system-wide outages.
- To streamline the new process of eliminating manual paging of On-call Software Engineers / Product specialists and early detection of "Class A" incidents.
- To automate the On-call shift of rotation Software Engineers / Product Specialists in responding to Critical tickets.

2. Literature Review

The IT services industry has been trying to solve the MTTR dilemma for decades. It also needs to consider the current evolution of the network environment and the challenges it poses in applying practical, scalable automation to incident management. Diagnosing incident management networks moves from a sequential, command-line interface-oriented approach to integrated, multi-threaded automation. Network engineering and architecture teams are typically the primary users of this use case, and their role is to deliver new services, reduce redundancies, and mitigate inherent risks. So far, however, the industry has not deployed automated solutions that enable infrastructure teams to perform this role more effectively. Industry Gap is an automation solution that improves network operations and improves

MTTR

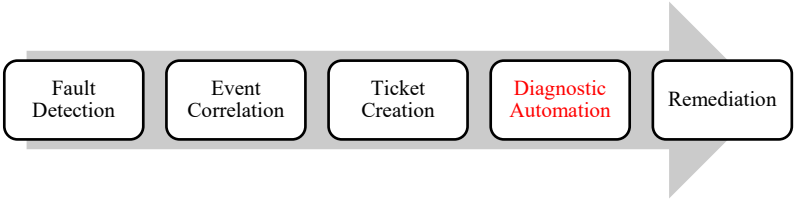

Figure 2. Triggered Automation Architecture

When an error occurs or an incident ticket is marked or classified as critical, the first challenge is the resulting idle time. The ticket will not work and potential diagnostic data may be idle before the investigation begins. Enabling automation bridges the gap between error detection and investigative action one of the goal. An event detection system needs to communicate with an automation system to automate diagnostics. There is an important concept here: a library of known issues. Once an incident is resolved and a solution is identified, the solution becomes part of the Known Issues Library or Technical Documentation. Therefore, every time a new incident occurs, a diagnosis of known problems should be made. As the library of known issues grows and relevant operational books are integrated into the automation framework, the automation system can quickly analyze all known past issues to determine if (1) a known issue already exists; gains the ability to determine that a fix is required for that new incident. or (2) remove it from the list of known issues to reduce troubleshooting time.

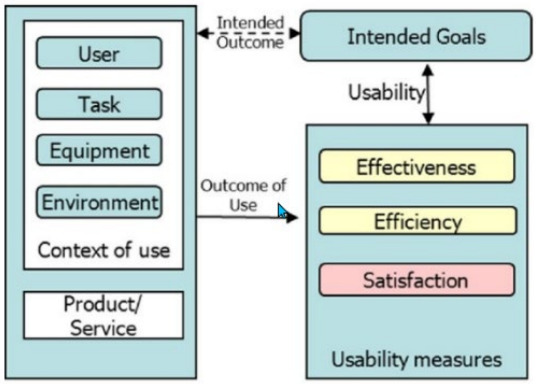

Figure 3. Usability framework of ISO 9241-11

ISO standards define how products can be used to achieve specific goals in specific situations. ISO defines usability as consisting of three key elements: Effectiveness, efficiency, and satisfaction (Hansen and Olsson, 2011). According to the ISO standard, the usability of a product is measured by how effectively it can be used and how few errors occur, rather than how easy it is to learn or remember (Kindlund and Sauro, 2005). This is because such qualities have a direct impact on productivity. A study using the ISO 9241-11 standards evaluated the usability of CRM user interface systems (ISO, 2018)

3. Methods

Figure 4 shows the conceptual framework of the study. The enhancement of the current Customer Relationship Management (CRM) User Interface (UI) will undergo usability testing based on the (ISO 9241-11) metrics. The users will be assigned a specific task in handling incident tickets. Using the current CRM UI, the effectiveness and efficiency will be measured on how they will resolve the ticket below 15 mins and if the ticket needs to be escalated to higher support if an immediate resolution can't be provided. From the degree of satisfaction, the satisfaction score results will be measured as well and the ratings of each user were compared to one another to find out how satisfied they were using the CRM in handling the incident ticket (Fan, et al. 2014). Then integration of RoboEOC as the application of the Automated Incident Management System to Human Centric Incident Ticketing Management Workflow shall contribute to lowering MTTR.

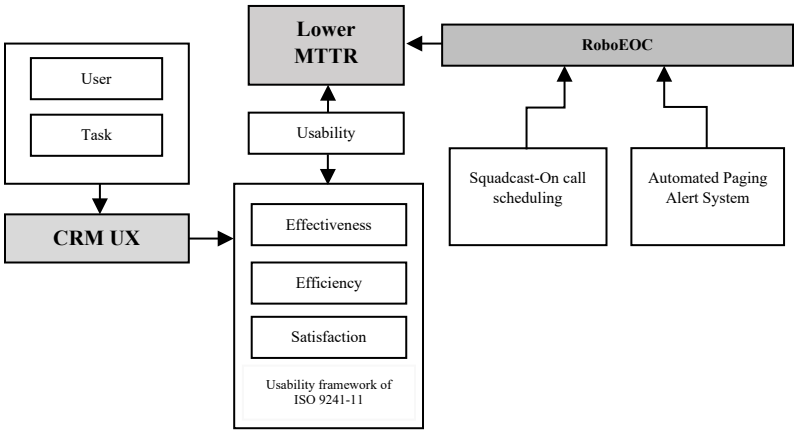

Figure 4 . Conceptual Framework

Ultimately, reducing MTTR requires transforming traditional incident management systems into new models supported by modern automation platforms and knowledge management frameworks. To support the points made in this document, let's consider a case study of a hypothetical implementation of a reduced MTTR automated deployment. The goal of such implementations is to incrementally empower engineering teams through automation. The diagram with automation shown in Figure 5 summarizes this complete incident response framework with automation applied to each phase.

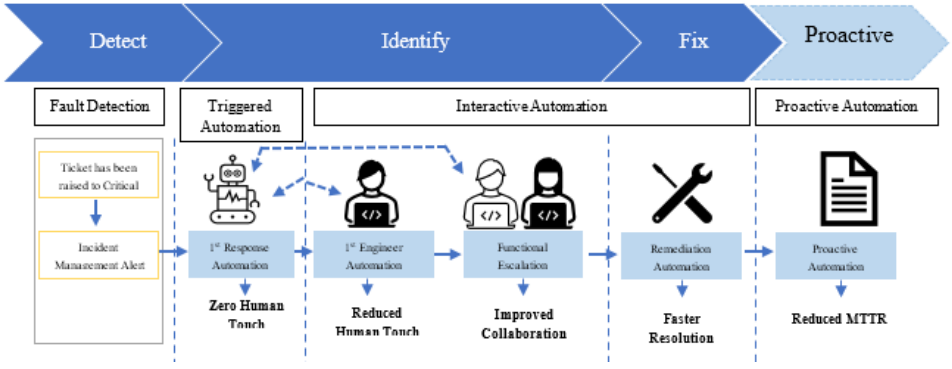

Figure 5. An Incident Management Response Automation Framework

4. Data Collection

To come up with a feasible solution an interview with the management and selected users was conducted to gain more insight into users' preferences and understand how they will be optimizing the current CRM platform and integration of RoboEOC to the current system. Time was dedicated to looking into how others are delivering a successful solution. A clear pattern was apparent throughout each - putting the most important sought-after information front and center. Below are the agreed feasible solutions that can be applied right away as they will not require high-level programming in changing the syntax of the existing CRM web platform

4.1 Redesigning the CRM Platform

In measuring the usability of the existing CRM Platform, the researcher counted how many tasks were completed in each scenario and noted how long it took for those tasks to be completed (Arthana, K., and Dantes, 2019). The successful task was symbolized by the number 1, while the failed task was symbolized by the number 0, in this case, study once the respondents fail to complete the task, automatically the time duration will be set to 15 mins as the maximum average handling time (AHT) of the department in handling the incident ticket. The four scores for each metric are gathered, and the SUM is calculated by averaging these numbers (Thomas, 2015). The metrics are all given the same importance, so they all contribute to the result, and this will be treated as an existing design. See Table 5 for the SUM results.

Table 5. SUM of the Existing (CRM)

Metric	Quality Level	z-score
Completion	71.67	3.7929
Error	28.33	0.5991
Satisfaction	61	3.0066
Times	64.87	3.2918
	SUM	**2.6726**

It was concluded that the efficiency of the current CRM platform is 64.87%. Based on the results 6 out of 10 users were unable to complete task no. 3 check for helpful links, knowledge-based information, SOPs, and related tickets that will support your findings to resolve the client's issues(s). It shows that most of the users will need more time to find the resources as they were unable to meet the 15-minute maximum AHT. While the satisfaction level of users who responded to the survey was 51%. The value was obtained from the combination of positive UX gains shows that 86% doesn't remember how to utilize icons, filtering feature, and commands. 64% did not find the prompts for inputs clear. 80% find the current CRM System unreliable in pulling up client information and access to related and reference tickets using a custom filter. And 76% of respondents answered that they can't send customized templates, formats, or canned messages saved in Salesforce CRM.

Data on MTTR shows if the assigned EOC were able to acknowledge the Critical Ticket in less than 15 mins. From the data collected the average MTTR of delay or no response of EOC in acknowledging the Critical tickets drives the MTTR into higher value, compared to the tickets that were acknowledged on "On time" the MTTR is 4.71 or low. In this study, the lack of resources for Emergency On-call Engineers which is a voluntary role for selected Engineering Managers from the US contributes to high MTTR for critical tickets. Emergency on-call engineers are typically a voluntary role in IT companies because the role requires Engineers to be available outside of their regular working hours to respond to incidents and emergencies. While a dedicated Product Specialist or Software Dev team is from a different time zone or region when the ticket has been tagged as critical, might be unable to respond ASAP, or delay in responding to paging alerts (Aguilar, 2023). The EOC will try to page the assigned-on call Product Specialist or Software Dev team, if there is no response within 15 minutes, 2nd attempt will be made, and if there is still no response after another 15 minutes, the manager of their team will be called out to assign himself or someone from his team to look on the issue. And despite the planned schedules and on-call rotation shifting rotations, there are 11 instances or 5% of critical tagged tickets from last year when no one was able to respond to paging alerts, and the manager was called out due to the on-call rotational plan from Excel is not always updated by the managers. When the Manager was called out, he/she will also manually assign an available direct report who can join, or himself/herself will join to respond in responding to critical alerts.

4.2. RoboEOC

The beauty of roboEOC is to provide transparency about critical incidents and how they are being triaged. It attempts to clearly show you what happened when the ticket was raised to critical severity. This includes telling you who was configured to be paged and providing links where you can manually page the team's yourselves. In addition, roboEOC provides transparency into what happened with these pages. In the past, responders typically didn't have access to see pages unless they owned them. Now, roboEOC provides transparency into exactly what happened with all the pages for a given critical ticket. We can now see if they were asked, escalated, closed, etc.

One of the major additional features of RoboEOC is the "Squadcast-On call scheduling" software. This feature is a way to see who is in charge and when they oversee a specific critical ticket. The on-call schedules feature the look and work better, like Google Calendar. It is easier to see who is on call each day, week, or month. This will allow you to see who you'll be working with and who will take over after you. It's simple to switch shifts or take time off too. Since one of the main goals of this new system is to replace the Emergency On-Call Engineers (human) with RoboEOC (automation), the Emergency On-Call Engineers will not be expected to be the main and initial responder now when the tickets have been tagged to Critical, instead they now going to be the administrator of "Squad cast-On call scheduling" feature of RoboEOC, which can set up On-Call rotations and customize schedules based on the business needs. the Emergency On-Call Engineers can make schedules for each team to be on-call, just like before. The new thing is that they can make the schedule look the way you want by picking the color for it on the calendar. Since one of the main goals of this new system is to replace the Emergency On-Call Engineers (human) with RoboEOC (automation), the Emergency On-Call Engineers will not be expected to be the main and initial responder now when the tickets have been tagged to Critical, instead they now going to be the administrator of "Squad cast-On call scheduling" feature of RoboEOC, which can set up On-Call rotations and customize schedules based on the business needs. the Emergency On-Call Engineers can make schedules for each team to be on-call, just like before. The new thing is that they can make the schedule look the way you want by picking the color for it on the calendar.

4.3 Usability Results of Redesign CRM User Interface (UI)

After evaluating usability on the existing CRM platform, we apply some improvements based on usability evaluation results, and user recommendations and consider Interaction Design Dimensions. And from the conducted interviews and analysis of the results, we have highlighted the downfalls of the current CRM system. (1) No canned templates can be created/modified/save inside CRM. (2) Technical SOPs/KBs are not available to be selected inside CRM (3) Unable to immediately check related and reference tickets (4) No tagging for "Class A" services and "Critical" severity for tickets. Major enhancement on CRM UI is adding "Critical" as one of the tagging on the ticket for severity and an additional text box on CRM to categorize correctly the ticket as "Class A" such as the number of affected clients, number of locations/firms affected, and specific Class A services affected being mentioned on the ticket through email or raised by the customers through inbound calls. A new confirmation prompt will add as a new feature as well where the ticket owner shall confirm if all the guidelines are met in flagging the ticket as a "Class A" incident and the priority to Critical. Below are the guidelines that will be proposed to introduce to all Tech Support Tier 1 and 2 Engineers.

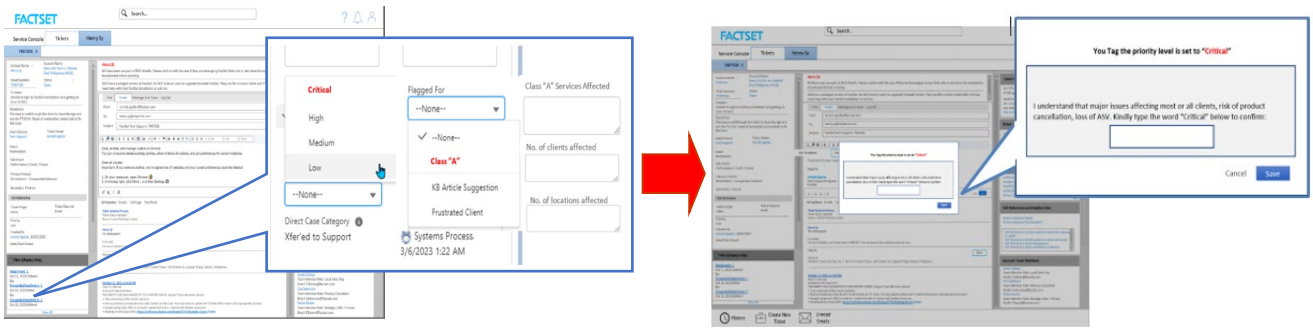

Figure 6. Adding of 'Critical" from the priority menu and "Class A" as flagged for option

A new confirmation prompt will add as a new feature as well where the ticket owner shall confirm if all the guidelines are met in flagging the ticket as a "Class A" incident and the priority to Critical. Below are the guidelines that will be proposed to introduce to all Tech Support Tier 1 and 2 Engineers.

- Class A service is impacted, and the issue is affecting clients.
- More than 10 unique individuals were added to the tickets.
- Class A services are listed below. Note that this is not a complete list.
    - *AUDS – File system used by most online applications*
    - *CID – Deployment tool for online applications*
    - *CRDS - Client Relational Database System, proxies/routes/executes SQL requests*
    - *AWS - AWS is used to host many of FDI's production systems. If AWS experiences a significant disruption/outage, then client impact is expected to be high more than 3 unique locations added to the ticket.*

To test the Usability of the Alternative UI Design additional sub-tasks were provided for each design to maximize the new features of the new CRM system. Each task will be evaluated the usability attribute based on ISO 9241-11 Usability Testing Standard. In this scenario, 20 people participated to perform the tasks. Using the same computation for usability in the existing CRM phase, the new computed usability test is relatively having a SUM closer to 3, which gives an overall of 3.71 SUM results which are 6.97 higher compared to the existing CRM design. The Effectiveness improved for getting 100% quality, the Efficiency having 90.45% quality, and the User-Satisfaction garnering 90.67%.

Table 6 . SUM of the New CRM UI

Metric	Quality Level	z-score
Completion	100	4.03
Error	90.45	3.55
Satisfaction	90.67	3.56
Times	64.87	3.2918
	SUM	**3.71**

5. Results and Discussion

The trial-run results cover the pilot testing of the transition from EOC to Automation that starts January 09, 2023, and until May 27, 2023. Table 7 shows, the values of MTTR after implementing the suggested solutions from the identified root causes of high MTTR. Table 7 shows the Trial-Run Results for January and May 2023, the results give an average of 4.932 MTTR. Comparing the MTTR, from Trial-Run Results to January and February 2023 .it is 63% lower than last year's (2022) record.

Table 7. MTTR from Trial-Run Result of RoboEOC (January to May) 2022 VS 2023

Months/Year	No. if Critical Incidents	MTTR	Ave MTTR
23-Jan	8	3.52	**4.932**
23-Feb	15	6.19	
23-Mar	28	6.42	
23-Apr	19	4.51	
23-May	23	4.02	

Months/Year	No. if Critical Incidents	MTTR	Ave MTTR
22-Jan	6	18.26	**13.34**
22-Feb	10	12.94	
22-Mar	10	14.5	
22-Apr	11	14.22	
22-May	23	6.79	

5.1 Arena Simulation

Arena simulation modeling plays a significant role in predicting the success and improvement of system workflows. In this study the major key reasons why Arena simulation modeling is important in this context is for the visual representation of the system workflow, making it easier to understand the current and new processes. This visualization aids in conveying information to stakeholders, facilitating discussions, and gaining consensus on improvement strategies in Incident Management Systems typical in Contact Centers and IT/Software companies.

5.1.2 Arena Model of the Improved System

As we can observe from the Arena Results of our original model the resource utilization of EOC (9%) is significantly less than the resource utilization of Tech Support Tier 1 (97%). Also, the average waiting time for each critical ticket in the queue is considerably high. The goal is to reduce the waiting time of each ticket mainly the critical incidents. In this current scenario by applying the two proposed solution which is the enhanced CRM UI and automation of paging alerts and on-call scheduling we are aiming to have a lower value of waiting time and overall stay of each critical ticket on the queue (MTTR) from functional escalation and troubleshooting.

To incorporate the suggested changes in our original simulation model as shown in Figure 7, we added a resource (enhance CRM UI) that will give a new decision parameter to escalate an identified "Class A" incident from the Tech Support Tier 1 queue right away. This will be possible by adding additional resources (RoboEoC) that would trigger automated paging alerts to dedicated Software Engineers and Product specialists once the ticket has a tagging of "Class A" type of incident.

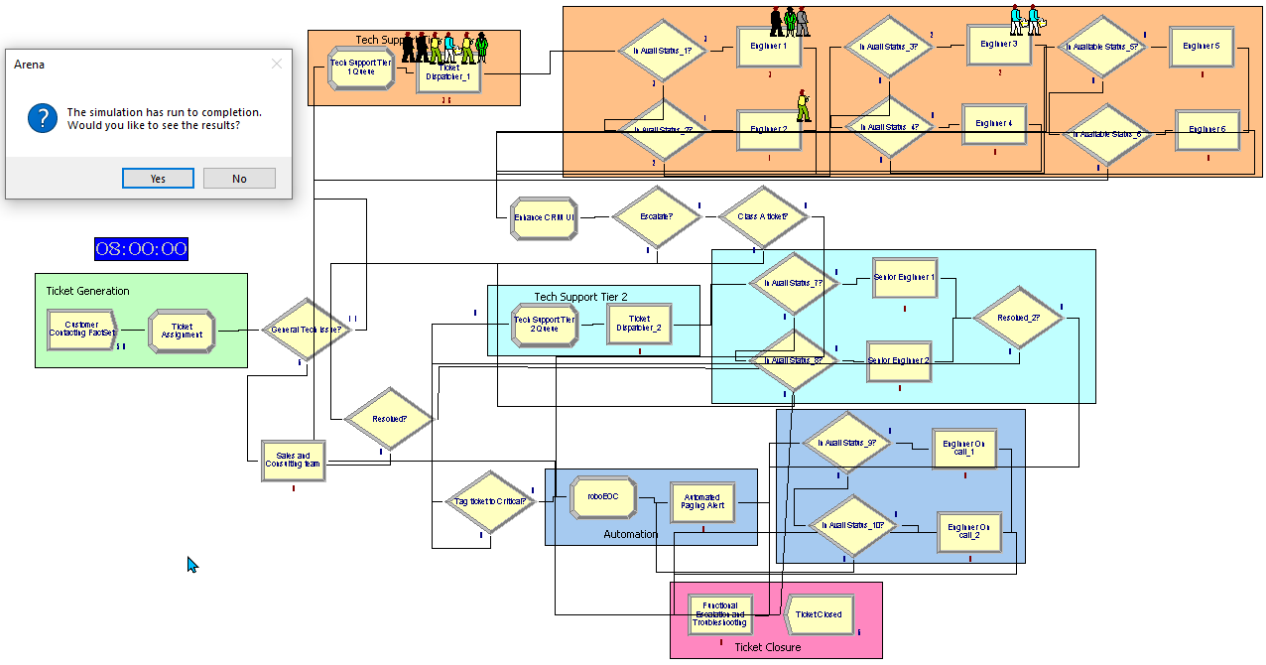

Figure 7. Automated Incident Management System (ARENA)

Table 8. Current System VS Proposed System

Activities	**Current System**	**Proposed System**
	EOC (Emergency-on-call)	**roboEOC**
Acknowledge	EOC Responds to alerts sent from OpsGenie	Critical alert sends to roboEOC
Initial investigation	Initially will check the critical issue and identify the relevance and ticket product category	Automatically tag/add the correct product to the ticket
Escalation and Paging	Manually page the relevant team that owns the product category	Automatically page the Product owners (Engineers/Specialists) on the ticket
Troubleshooting and discussion of the critical issue	Joins the discussion channel via MS Teams together with other team members involved	Only the relevant team will be notified to join the discussion channel and will automatically save the chat transcript/call recordings/video conference (EOC is not required to join)
Resolution and Recovery	Responsible to identify the ETA of the resolution if the root cause has been identified and will post the update on the critical ticket	The Software Eng'g/Product team shall post the update or resolution summary to the incident critical ticket.
Incident Closure	Initiate the downgrade of the critical ticket and will send notifications to an affected client regarding the issue	roboEOC will post the summary of an incident ticket, timestamp of ack'd, escalation, reason for closure, etc.
		Notifications will be sent automatically to affected clients

Table 9. Simulation of the Current and Proposed Process

Simulation Results				
Process	**Current System**		**Proposed System**	
	Average Completion Time (Hours)	**Average Waiting Time Average (Hours)**	**Average Completion Time (Hours)**	**Average Waiting Time Average (Hours)**
Acknowledge	7.0867	3.54	1	1
Initial investigation				
Escalation and Paging	8.15	3.3855	0.5753	0
Troubleshooting and discussion of the critical issue				
Total	15.2367	6.9255	1.5753	1

Table 10. Time difference between the current and proposed system

Process	**Average Completion Time**		**Average Waiting Time**	
	Amount of Time Reduce	**Percent Reduced**	**Amount of Time Reduce**	**Percent Reduced**
Acknowledge	6.0867	96.45%	2.54	99.00%
Initial investigation				
Escalation and Paging	7.5747	96.03%	3.3855	96.61%
Troubleshooting and discussion of the critical issue				
Total	13.6614	96.24%	5.92	97.81%

6. Conclusion

The System problem being studied in this paper is the Incident Management workflow of FDI in responding to critical incidents due to unplanned or unexpected outages or system-wide issues that affect the functionality and reliability of the software products. The gathered data was from Fiscal year 2022 (January 2022 to December 2022) wherein 220 reported tickets have been escalated to critical and it accumulated 1899.97 total hours of downtime and an overall MTTR of 8.64. Moreover, an interview and survey of the stakeholders involved in responding to critical tickets give more clarity for the main causes of high-resolution time (Mean Time to Recovery) for each critical ticket.

The cause for the Tech Support Tier 1 not to meet the SLA of 15 mins in handling per incident is due to poor usability of the Customer Relationship Management (CRM) tool, 89% of Class "A" identified tickets can't be fixed by Tech Support Tier 1 and requires functional escalation for the Software development and Product team to fix. Last Fiscal Year data shows that 26% of Class "A" identified tickets can't be resolved by Tier 2 as well and will be tagged as critical for functional escalation. In addition, 'Class A' tickets requires collaboration with multiple users and IT professional of affected firms or companies, and immediate functional are required for the On-call Engineers and Specialist to respond. This brings the idea for this study to measure the current CRM UX Usability and create a new tagging for Class "A" incidents that will allow Tech Support Tier 1 to escalate a ticket to critical directly for the Functional Escalation team, using automated paging alerts. The proposed implementation of RoboEOC "Transforms Human Centric Incident Management System to Automation", before the EOC will need to pull up an Excel Sheet online to verify who the On-call Engineers for the specific issues/product that needs to page to be called out. This consumes more minutes/hours, most especially if the primary scheduled on-call is not responsive and the EOC will need to call out the manager to assign a new responder, or the manager himself/herself can take over. Another highlight for RoboEOC is the "Squadcast-On call scheduling", this is an embedded software, that will allow a few administrators to check who is on-call each day, week, or month.

The Emergency On-Call Engineers (human) will be replaced by the RoboEOC (automation) on the new workflow, the Emergency On-Call Engineers will not be expected to be the main and initial responder now when the tickets have been tagged to Critical, however, they can still monitor the logs, event viewer, and be part of the creation postmortem if needed. The current and proposed system was run in arena simulation and the results are shown in Table 10. The table shows that the proposed system drastically reduces the number of hours for acknowledging and for the initial investigation of critical incidents. The Arena simulation was able to show that the proposed system of improving the incident management for lower MTTR for critical tickets can reduce the average completion time by at least 96.24% and reduce the average waiting time of 97.81% for the ticket to be resolved. The simulation shows that by implementing the proposed system, FDI can feasibly obtain the goal of 5 hours or lower MTTR for each incident ticket by the end of Fiscal year 2023.

References

Aguilar, A. , Lowering Mean Time to Recovery (MTTR) in Responding to System Downtime or Outages: An Application of Lean Six Sigma Methodology. *In 13th Annual International Conference on Industrial Engineering and Operations Management, 2023*, https://doi.org/10.46254/AN13.20230039.

Arthana, I., K., P. M., and Dantes, G. R. , Usability testing on the website wadaya based on ISO 9241-11. *Journal of Physics: Conference Series, Volume 1165, The 1st International Conference on Vocational Education and Technology, 2019.* https://10.1088/1742-6596/1165/1/012012

Fan, R. Luck, K. Manier, J. Pierce, L. Pool and S. D. Patek, "Customer relationship management for a small professional technical services corporation," *Proceedings of the 2004 IEEE Systems and Information Engineering Design Symposium*, 2004., Charlottesville, VA, USA, 2004, pp. 243-248, doi: 10.1109/SIEDS.2004.239940.Hansen, G. K., & Olsson, N. O. (2011).

Fernandez A., Insfran E. and Abrahão S., Usability evaluation methods for the web: A systematic mapping study Inf. Softw. Technol. 53 789-817,2011. https://doi.org/10.1016/j.infsof.2011.02.007

ISO. (2018). Ergonomics of human-system interaction. Part 11: Usability: Definitions and concepts. *[Online]. https://www.iso.org/standard/63500.html#:~:text=ISO%209241%2D11%3A2018%20provides,services%20(including%20technical%20and%20personal*

ISO (2018)*"Ergonomics of human-system interaction - Part 11: Usability: Definitions and concepts,", Iso/Np 9241-11,2018. [Online]. https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-2:v1:en*

Jeff Sauro, (2011*) "What Is A Good Task-Completion Rate?,". [Online]. Available: https://measuringu.com/task-completion/.*

Jeff Sauro and Erika Kindlund. , A method to standardize usability metrics into a single score. *In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '05). Association for Computing Machinery, New York, NY, USA,* 401–409, 2005. https://doi.org/10.1145/1054972.1055028

Thomas N., "How To Use The System Usability Scale (SUS) To Evaluate The Usability Of Your Website," , 2015. [Online] https://usabilitygeek.com/how-to-use-the-system-usability-scale-sus-to-evaluate-the-usability-of-your-website/

Biography

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